

COMPACT UHF SYNTHESIZED FM PORTABLE RADIO

TK-320/320(DM)

SERVICE MANUAL

KENWOOD

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GENERAL

INTRODUCTION

SCOPE OF THIS MANUAL

This manual is intended for use by experienced technicians familiar with similar types of commercial grade communications equipment. It contains all required service information for the equipment and is current as of the publication date. Changes which may occur after publication are covered by either Service Bulletins or Manual Revisions. These are issued as required.

ORDERING REPLACEMENT PARTS

When ordering replacement parts or equipment information, the full part identification number should be included. This applies to all parts: components, kits, or chassis. If the part number is not known, include the chassis or kit number of which it is a part, and a sufficient description of the required component for proper identification.

SERVICE

This radio is designed for easy servicing. Refer to the schematic diagrams, printed circuit board views, and alignment procedures contained within.

NOTE.

WE CANNOT guarantee oscillator stability when using channel elements manufactured by other than KENWOOD or its authorized agents.

FCC COMPLIANCE AND TYPE ACCEPTANCE NUMBERS

Type acceptance number	Frequency range	Compliance
ALH9TKTK-320-1	450 ~ 470MHz	Part 15, 22, 74, 80, 90 and 95

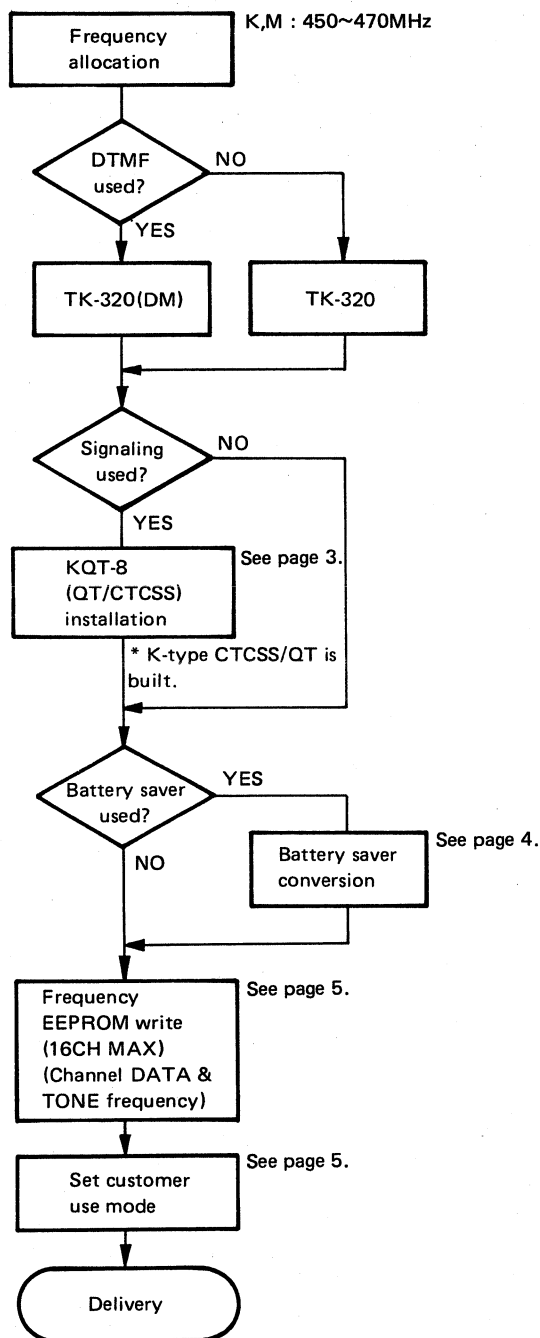
PERSONNEL SAFETY

The following precautions are recommended for personnel safety:

- DO NOT transmit until all RF connectors are verified secure and any open connectors are properly terminated.
- SHUT OFF and DO NOT operate this equipment near electrical blasting caps or in an explosive atmosphere.
- This equipment should be serviced by a qualified technician only.

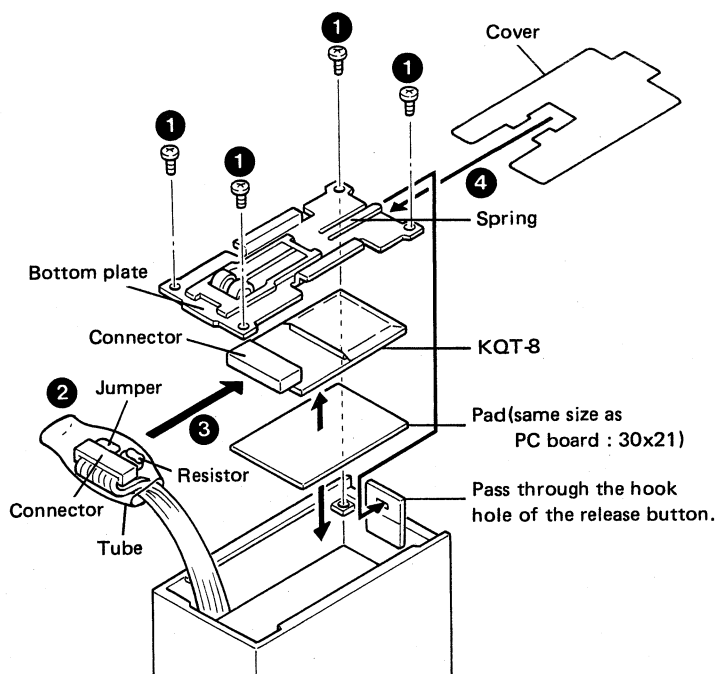
SYSTEM SET-UP / INSTALLATION

System Set-up



Installing KQT-8

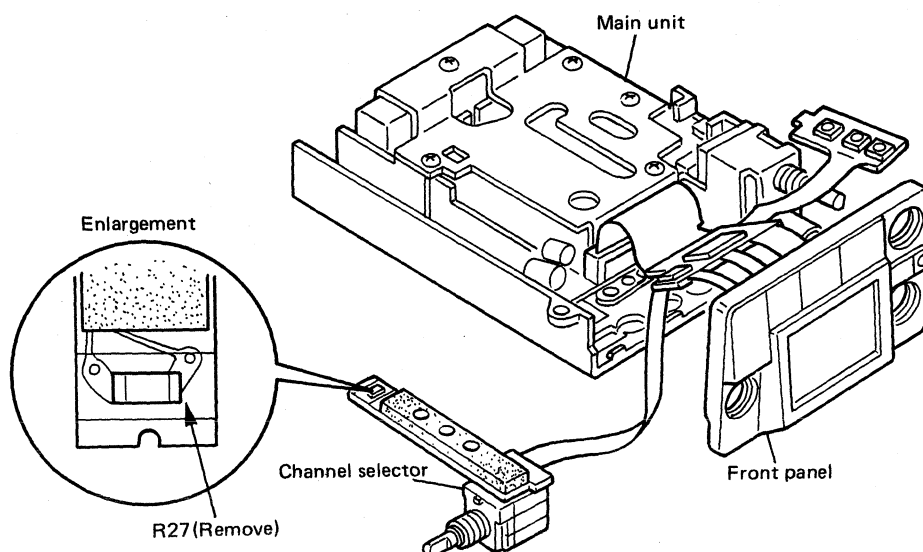
1. Stick the supplied pad on the foil side of KQT-8.
2. Remove the battery pack from the radio, and remove the 4 screws fixing the bottom plate of the radio (①).
3. Lift the bottom plate and take out the connector (②).
4. Remove the transparent tube that covers the connector. Remove the resistor and jumper that are connected to connector pins.
5. Mate the connector (from which the resistor and jumper were removed in step 4) with the KQT-8 connector (③).
6. Remove the remaining sheet of paper from the pad stuck on the back of KQT-8, and then attach KQT-8 to the radio.
7. Insert the cover into the bottom plate with its glossy side facing toward KQT-8 (④).
8. Push up the release button, pass the spring section of the bottom plate through the hook hole, and secure the bottom plate on the main unit. (Take care not to get any wires between the bottom plate and the main unit.)



CONVERSION

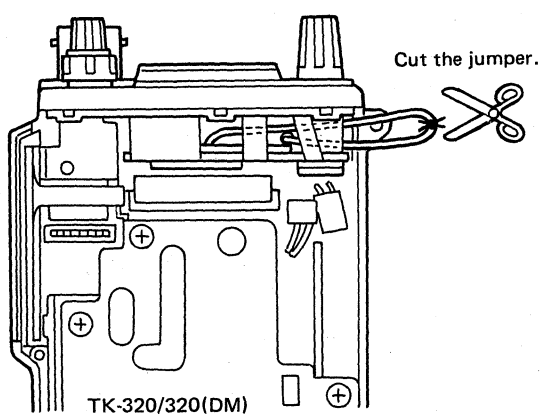
Disabling Battery Saver

1. Disassemble according to the disassembly procedure for the front panel (See disassembly for repair 1,2,3, and 6).
2. Remove R27 (at the end of the FPC of the channel selector) in the control unit (X53-3170-10). The battery saver will be disabled.



Setting Customer Use Mode

1. Remove the front shell (See disassembly for repair 1,2, and 3).
2. Pull out and cut off the green lead between the front panel and the control unit (X53-3170-10).



3. Replace the removed lead.

FREQUENCY WRITING METHOD

Frequency Writing Method (Channel Data and Tone Frequency)

1. Frequency Setting Mode (Memory Write)

• Notes

The frequencies for all channels have been factory set. If they are not required, clear the memory by switching the power on, while holding the MONITOR switch down. (Channel 1, however, is always initialized to 460MHz.)

Individual channels can not be cleared.

Normally, the frequency is changed in 12.5kHz steps. If LAMP switch is held down while the channel selector is turned, the frequency may be changed in 1MHz steps.

In this mode, transmission and reception are impossible.

• Writing Method (See Flowchart)

When the power is turned on, the system enters the receive frequency setting mode, starting with channel 1. Set the receive frequency and tone frequency for each channel as follows :

- (1) Set the receive frequency with the channel selector.
- (2) Press the PTT switch. The receive frequency specified in step 1 is memorized and the channel indicator shows receive tone frequency input mode.
- (3) Set the receive tone frequency with the channel selector and press the PTT switch.
- (4) The channel indicator now shows transmit frequency input mode. Set the transmit frequency by following step 1 to 3.



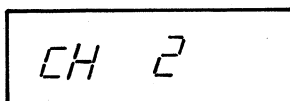
- (5) Repeat steps 1 to 4 for the channels for which frequencies need to be set.
- (6) If frequencies for a channel need not be set, simply press the PTT switch. The next step will be displayed.
- (7) When all 16 channels have been set up, "END" is displayed.
- (8) When the MONITOR switch is pressed, the written data is displayed sequentially. If necessary, the data may be modified by turning the channel selector and pressing the PTT switch.

2. Customer Use Mode

This mode is set by writing frequencies into memory in the frequency setting mode and cutting the internal jumper of the radio (control unit, D4). In this mode, the channel for which the transmit, receive, and tone frequencies have been memorized with the channel selector may be recalled and transmission or reception mode.

CHANNEL INDICATOR

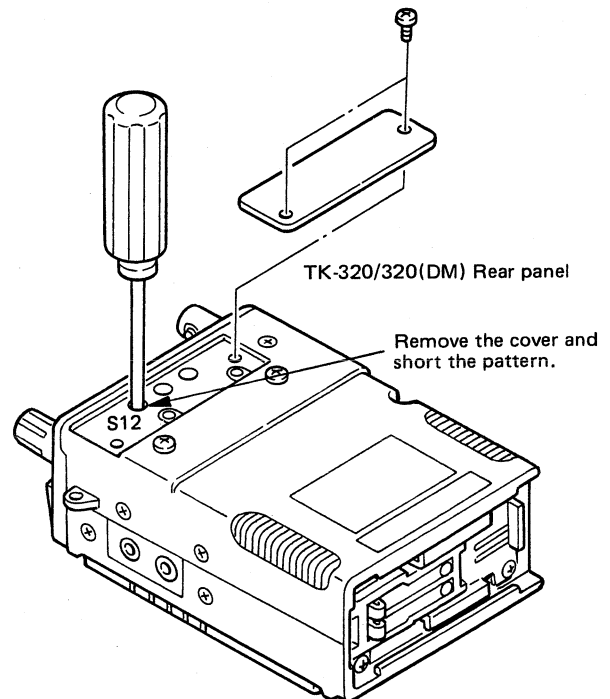
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3. Read Mode (The jumper in the Radio is Cut.)

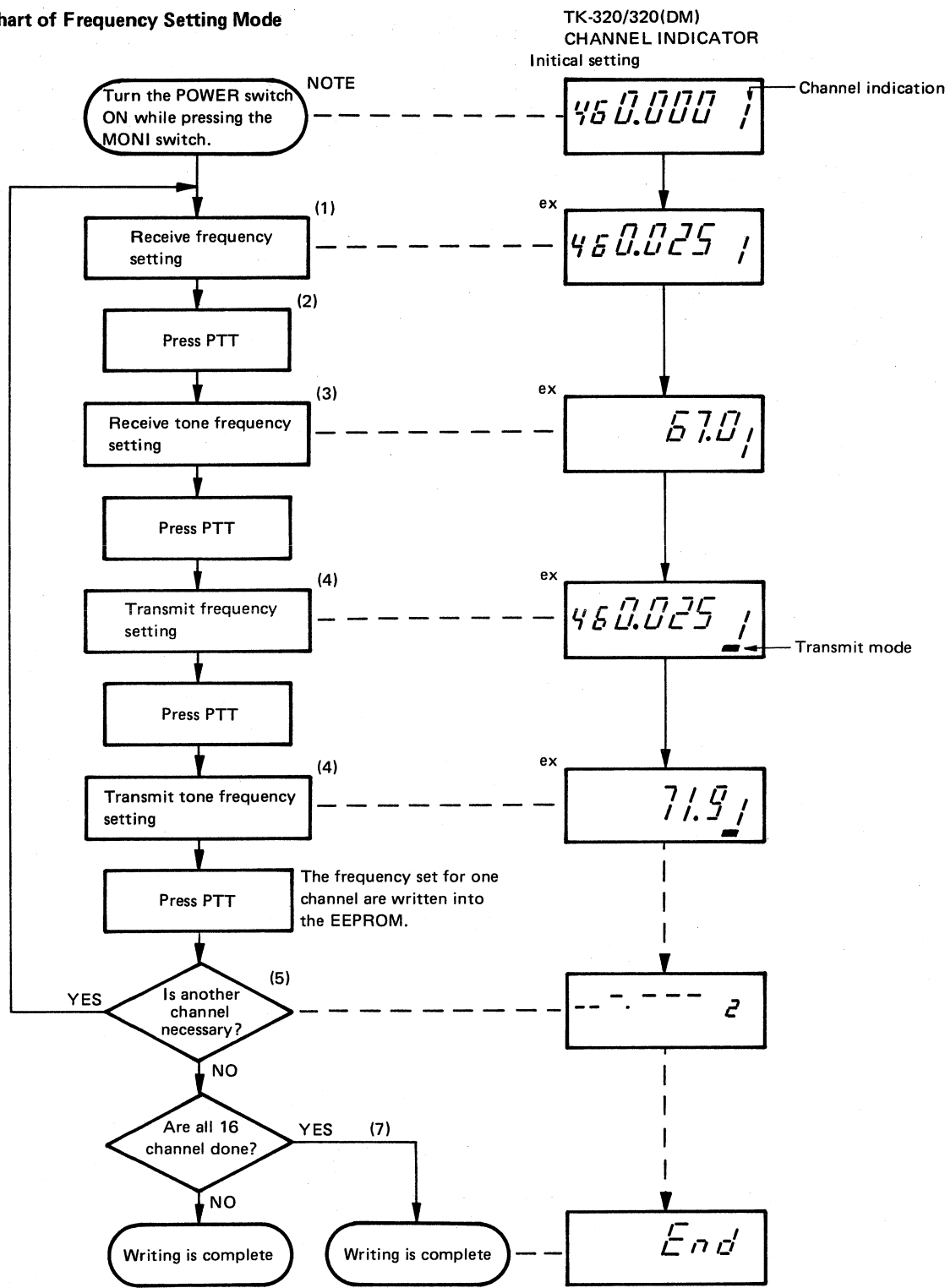
The contents of the memory can be read by pressing the MONITOR switch in customer use mode. (Transmission and reception are impossible.)

While short S12 (pattern) under the cover on the rear of the radio with the tip of a screwdriver as shown below, turn the POWER switch ON to set this mode.



FREQUENCY WRITING METHOD

4. Flowchart of Frequency Setting Mode



DISASSEMBLY FOR REPAIR

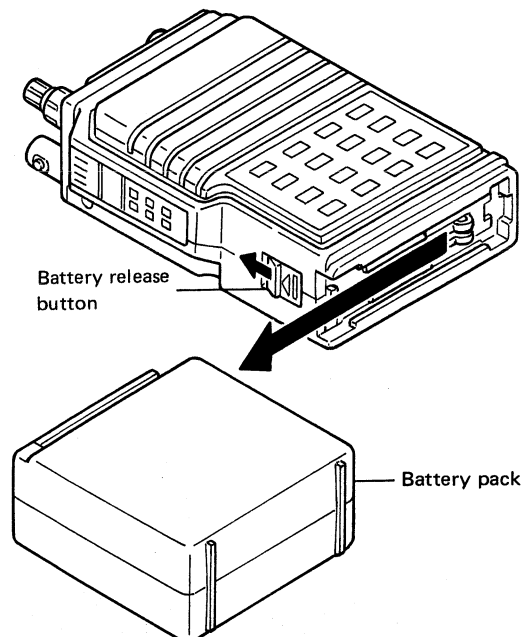
When making repairs, use the disassembly procedure specified for each location.

		Numbers for complete disassembly
1	Remove the front shell (on the SP side)	1, 2, 3
2	Check the components on the TX-RX unit	1, 2, 3, 10 (①, ②, ③)
3	Check the foil side of the TX-RX unit	1, 2, 3, 10 (②', ④, ⑤, ⑤')
4	Replace the components of the TX-RX unit	1, 2, 3, 10 (①, ②, ②', ③, ④, ⑤, ⑤')
5	Disassemble only the front panel	1, 2, 3, 6, 7, 8
6	Disassemble the MIC, SP, and DTMF unit	1, 2, 3, 4

Complete Disassembly

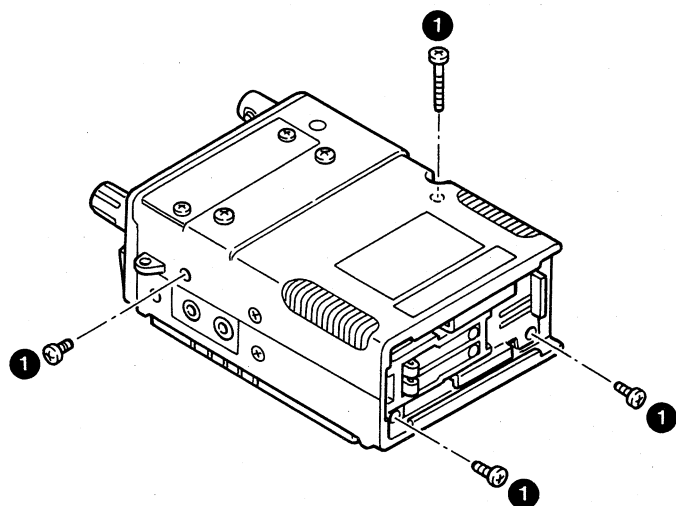
1. Removing Battery

1. While pressing the battery release button in the direction of the triangle "△", slide the battery pack sideways and remove it from the radio.



2. Removing Screws Holding the Case

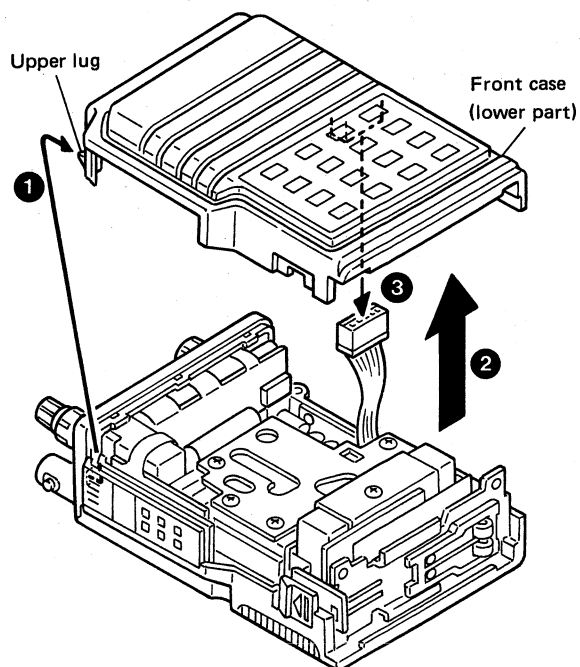
1. Remove the 4 screws holding the case (①).



DISASSEMBLY FOR REPAIR

3. Removing Front Case

1. Lift the front shell (lower part), remove the upper lug (1), and then remove the entire front case (2).
2. Remove the MIC and SP connector cables in the front shell (3).



Caution : Assembling the Front Case

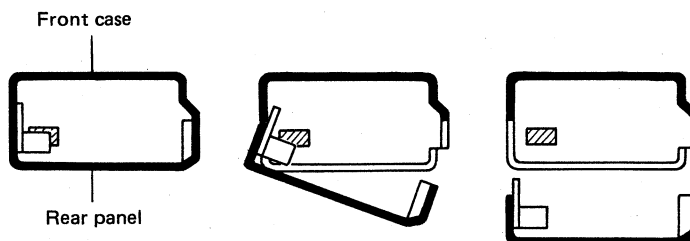
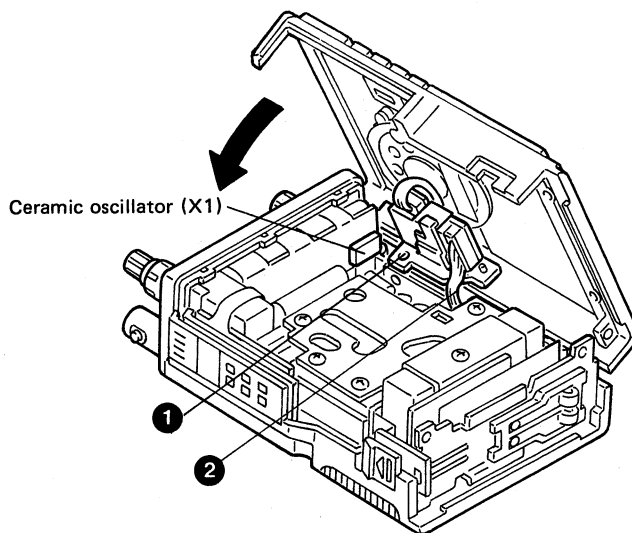
When inserting the ceramic oscillator (X1) mounted on the FPC of the front panel into the front case, use the following procedure, taking care not to damage the oscillator against the SP jack.

1. Insert the shell from the right side first, rather than from above.
2. Make sure that the SP jack is located under the ceramic oscillator (X1).

Take care that the screw (1) holding the SP and MIC jacks does not catch the FPC.

3. Insert the left side of the case carefully.

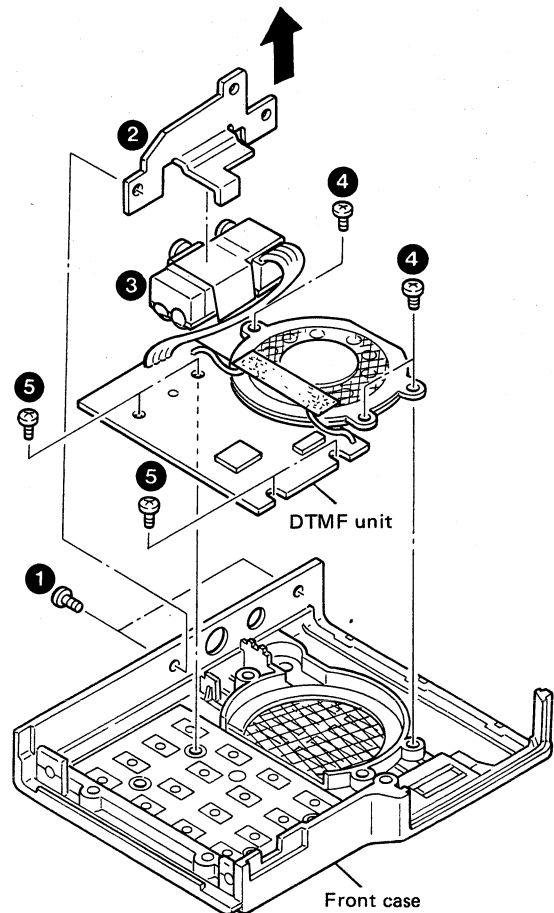
Note : Cable should not be between a front panel and TX-RX unit (2).



DISASSEMBLY FOR REPAIR

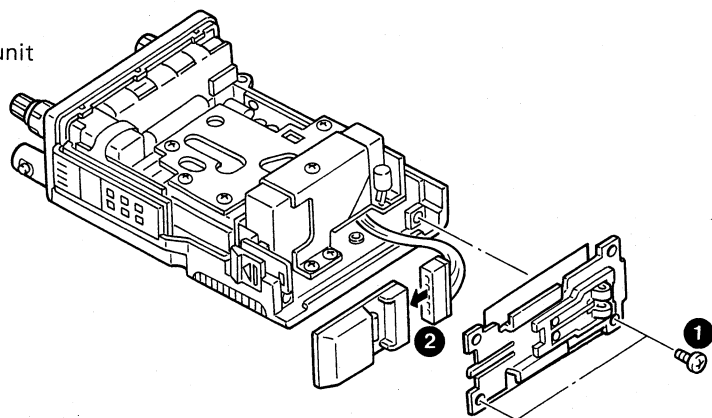
4. Removing MIC, SP, and DTMF Unit (in Front Case)

1. Remove the 2 screws from the case (1).
2. Lift the upper part of the metal fitting slightly (2) and take out the SP and MIC jack unit (3).
3. Remove the 3 screws from the SP (4) and take out the SP.
4. Remove the 4 screws from the DTMF unit (5) and take out the DTMF unit.



5. Removing QT/CTCSS Unit

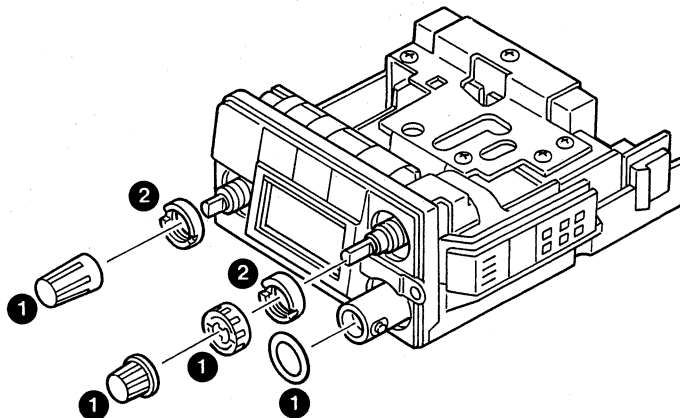
1. Remove the 2 screws from the case (1).
2. Disconnect the connector lead from the QT/CTCSS unit and remove the QT/CTCSS unit (2).



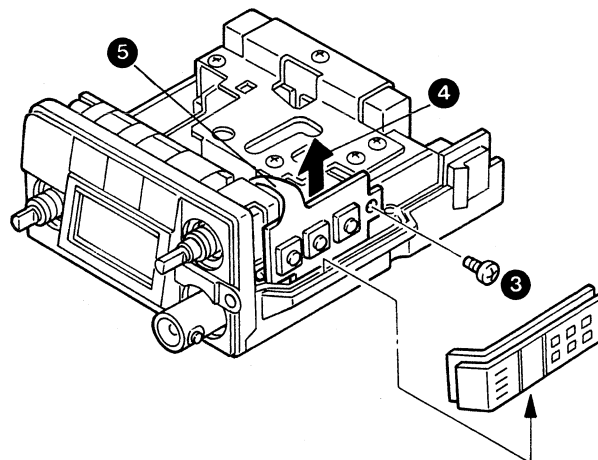
DISASSEMBLY FOR REPAIR

6. Removing Front Panel

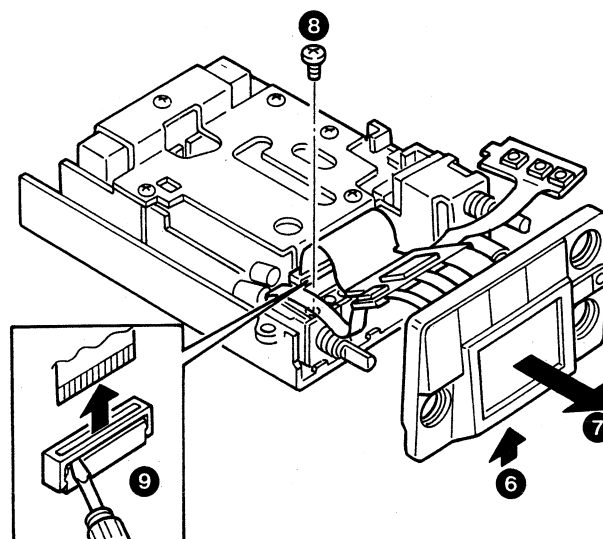
1. Pull off the 3 knobs and ring from the panel (1).
2. Remove the 2 round nuts (2).



3. Remove the screw (3) and lift off the SW unit (4), taking care not to break off the FPC (5).



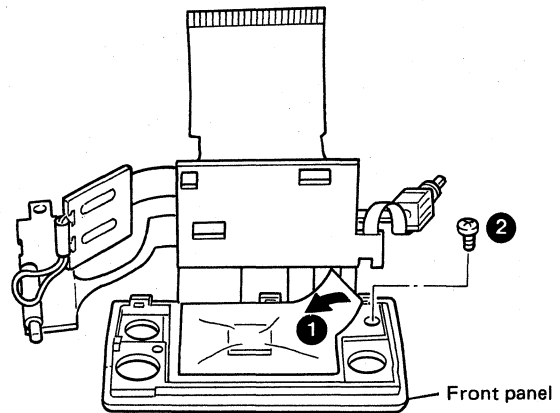
4. Slightly lift the front panel in the direction of the arrow (6) and lift off the panel (7).
5. Remove the screw (8), unlock the FPC connector lock with the tip of a screwdriver, and remove the FPC (9).



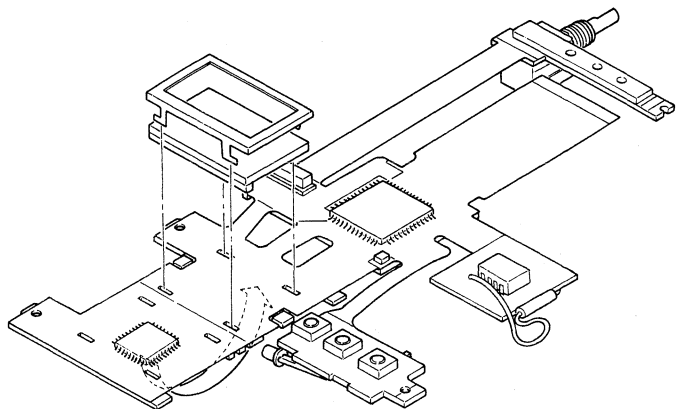
DISASSEMBLY FOR REPAIR

7. Disassembling Front Panel

1. Remove the sheet (①) and remove the screw (②) holding the LCD PC board.

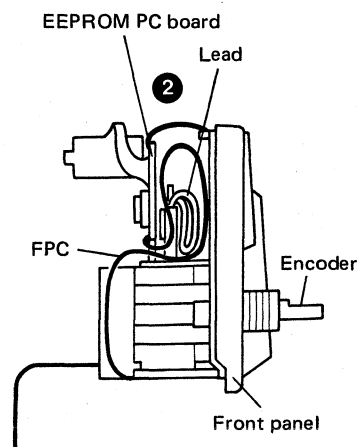
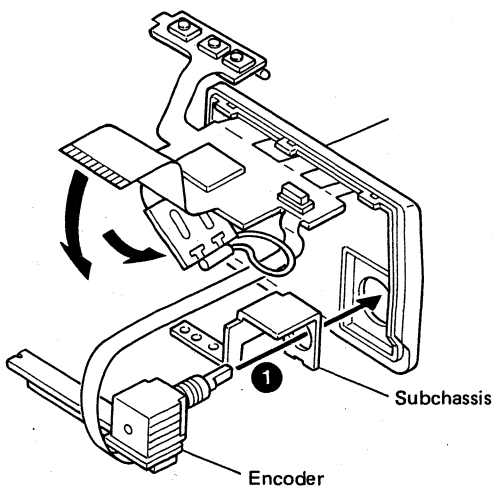


8. Installing LCD Panel



9. Assembling Front Panel (Flexible PC Board)

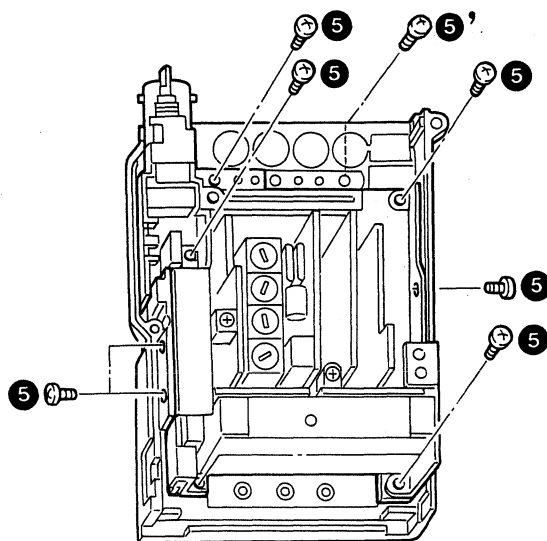
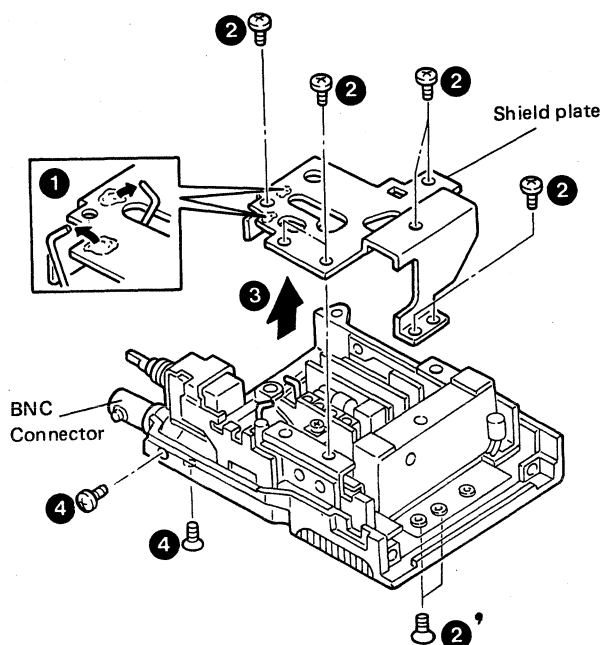
1. Insert the subchassis into the encoder, and install the encoder on the front panel (①).
2. Insert the EEPROM PC board lead between the FPC of the encoder and fold the CPU board (②).



DISASSEMBLY FOR REPAIR

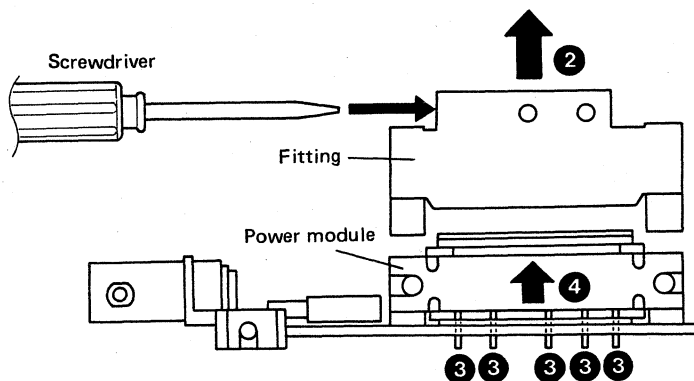
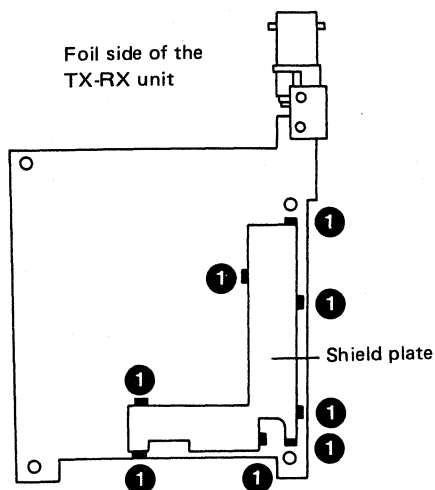
10. Removing the TX-RX Unit

1. Remove the two leads soldered to the shield plate (1).
2. Remove the 7 screws (2) that hold the shield plate and lift off the shield plate (3).
3. Remove the 2 screws from the BNC connector that holds the rear panel (4).
4. Remove the 8 screws holding the rear panel (5).

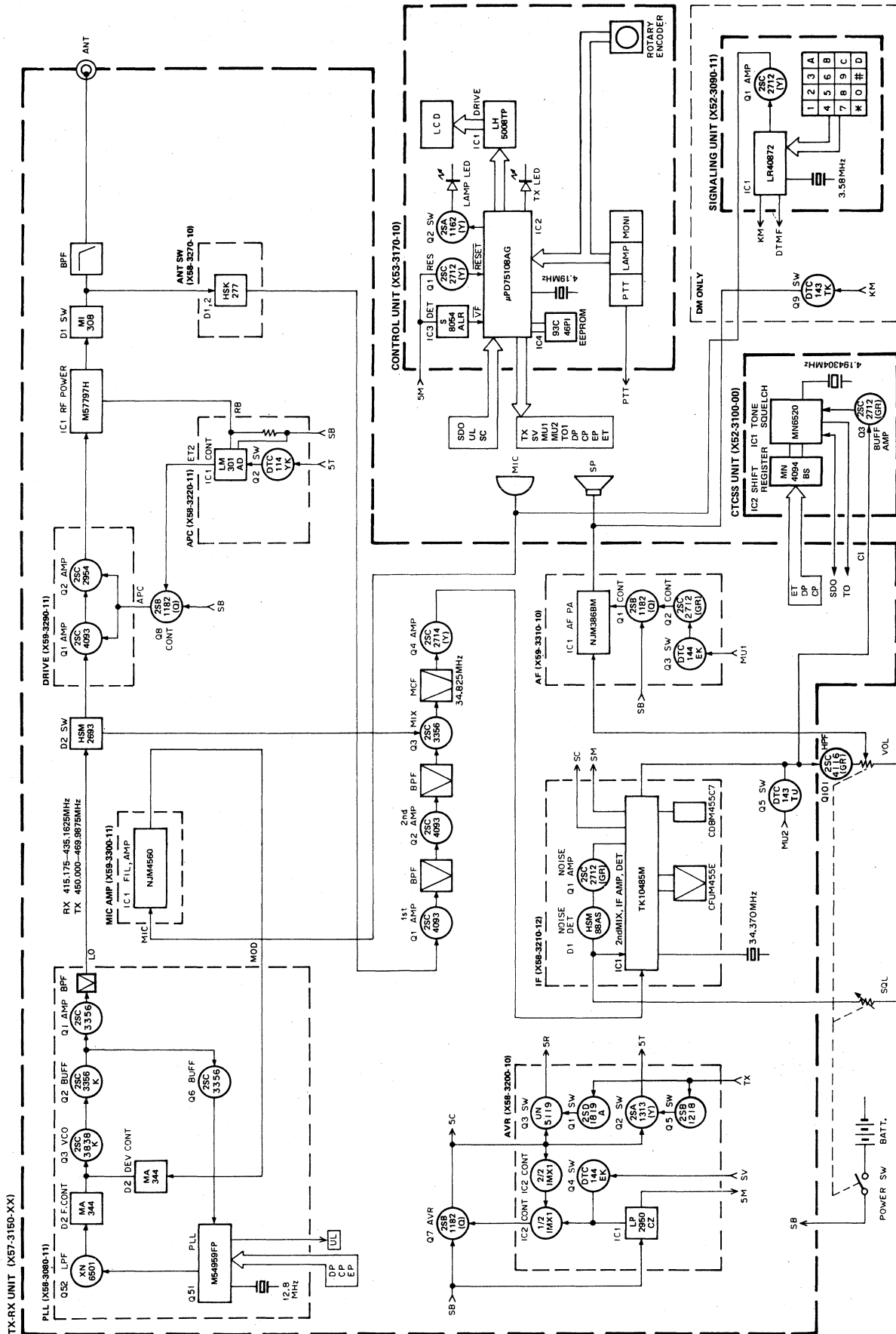


11. Removing Power Module (TX-RX Unit)

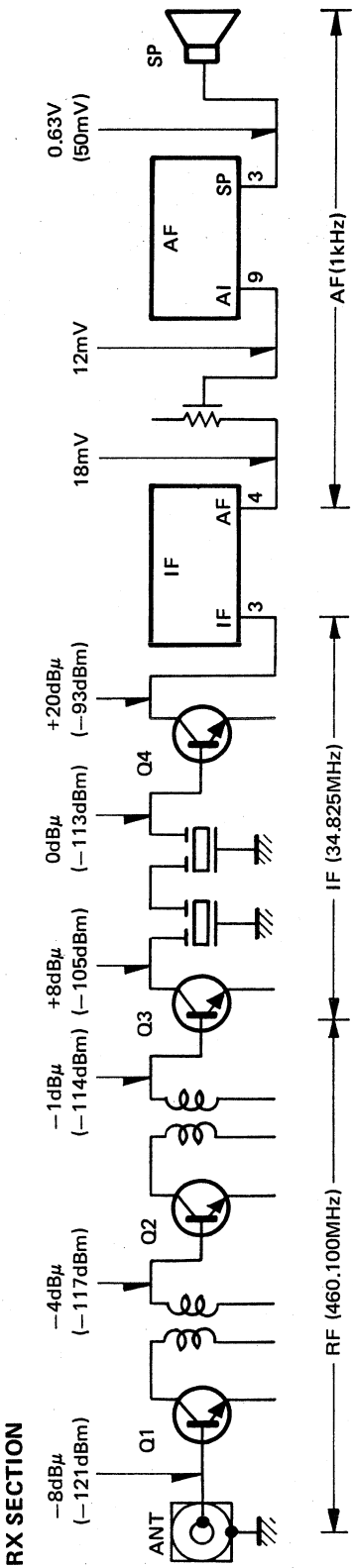
1. Desolder the 8 soldered parts of the shield plate on the foil side of the TX-RX unit and remove the shield plate (1).
2. Remove the metal fitting on the power module by inserting a screwdriver (2).
3. Desolder the 5 soldered leads (3) of the power module fixed on the TX-RX unit and pull off the power module (4).



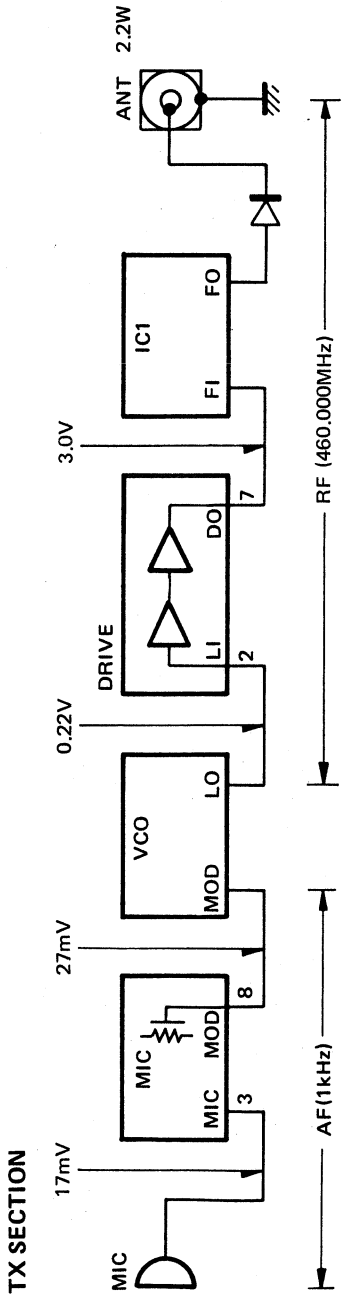
BLOCK DIAGRAM



LEVEL DIAGRAM



1. SSG output : 460.100/34.825MHz, MOD : 1kHz, DEV : 3.0kHz
2. These SSG signal level values are necessary in order to obtain the 12dB SINAD audio signal.
3. SSG output was measured, using a 470pF capacitor.



1. ANT is terminated with 50Ω.
2. DC power supply : 7.5V.
3. Level was measured, using high impedance type voltmeter.

CIRCUIT DESCRIPTION

The TK-320 consists of a control unit, CTCSS unit, and TX-RX unit. The TX-RX unit consists of eight small sub-units, and processes most of the functions of the transceiver.

Frequency Organization

The TK-320 uses a PLL synthesizer system incorporating a digital VFO that has a channel step of 12.5kHz.

The receiver system configuration is based on the double super-heterodyne method with a first intermediate frequency of 34.825MHz and a second intermediate frequency of 455kHz. Incoming signals from the antenna are mixed with the first local oscillator signal to produce the 34.825MHz first intermediate frequency signal. The first intermediate frequency signal is mixed with the 34.370 MHz second local oscillator signal to produce the 455kHz second intermediate frequency signal.

Transmission signals of half the desired frequency are generated by the PLL VCO, amplified by amplifiers that double the frequency, and fed to the antenna terminal.

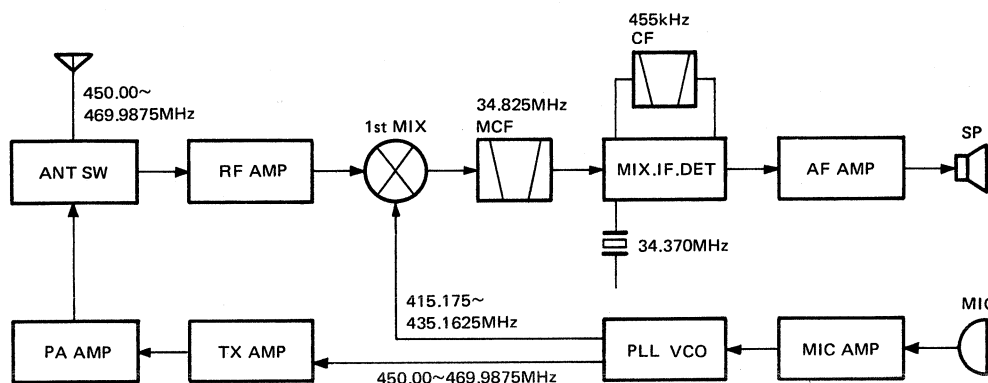


Fig. 1 Frequency organization

TX-RX Unit

The TX-RX unit consists of the RX unit, TX unit, PLL unit, and power supply.

1. RX Unit

Incoming signals (f_R) from the antenna pass through the BPF and SUB UNIT (ANT SW) : Z1 and enter the RF amplifier. The signals are amplified by the second RF amplifier, consisting of Q1 : 2SC4093 and Q2 : 2SC4093. Undesired signals are attenuated by the BPF and helical tuning circuit. The resulting signal is mixed with a local signal ($f_R - 34.825\text{MHz}$) from the SUB UNIT (PLL) : Z8 by the MIX, Q3 : 2SC3356, to produce the 34.825MHz first intermediate frequency signal.

The first intermediate signal passes through the second monolithic crystal filter MCF (XF1 and XF2) where undesired signals are further removed. The signal passes through the IF amplifier, Q4 : 2SC1714(Y), then enters

the IF IC, IC1 : TK10485MT1(B,C), in the SUB UNIT (IF) : Z2. The IF IC contains the second mixer, second local oscillator, IF limiter amplifier, quadrature detector, noise amplifier, and squelch switching circuits.

The signal input to the IF IC is mixed with the 34.370 MHz second local oscillator signal to produce the 455kHz second intermediate frequency signal. The second intermediate frequency signal passes through a ceramic filter (CF1) where undesired components are removed and reenters IC1. The signal is then amplified by the IF limiter amplifier and is quadrature detected by the ceramic discriminator (CD1) to produce an AF signal.

The AF signal from the IF IC in Z2 passes through the HPF Q101 : 2SC4116(GR), and AF VOL and enters the AF power amplifier, IC1 : NJM386BM, in MODULE UNIT (AF) : Z3. This amplifier outputs a 0.2W signal to the speaker.

Item	Rating
Nominal center frequency	34.825MHz
Pass bandwidth	$\pm 7.5\text{kHz}$ or more at 3dB
Attenuation bandwidth	$\pm 28\text{kHz}$ or less at 40dB
Ripple	1.5dB or less
Insertion loss	3dB or less
Guaranteed attenuation	60dB or more within $\pm 1\text{MHz}$ Spurious : 40dB or more
Terminal impedance	$800\Omega \pm 10\%$ / $2\text{pF} \pm 10\%$

Table 1 MCF (L71-0284-05) (TX-RX unit XF1, XF2)

Item	Rating
Center frequency of 6dB bandwidth (f_o)	$455\text{kHz} \pm 1.5\text{kHz}$
6dB bandwidth	$\pm 7.5\text{kHz}$ or more
40dB bandwidth	$\pm 15\text{kHz}$ or less
Ripple	1.5dB or less ($455\text{kHz} \pm 1.5\text{kHz}$)
Guaranteed attenuation	27dB or more within $f_o \pm 100\text{kHz}$
Insertion loss	6dB or less
Terminal impedance	$1.5\text{k}\Omega$

Table 2 Ceramic filter (L72-0362-05) (IF unit CF1)

CIRCUIT DESCRIPTION

• Noise Squelch Circuit

Only noise components are removed from the AF signal output by the FM IF IC, IC1 : TK10485MT1(B,C), in SUB UNIT (IF) : Z2. The resulting signal is amplified by the amplifier in IC1 and the noise amplifier, Q1 : 2SC2712 (GR), and rectified by D1 : HSM88AS. The DC voltage is adjusted by SQL volume control and data is sent to the MPU, IC2 : μ PD75108AG, in the control unit by switching in IC1. The microprocessor determines the current condition, and outputs mute signals MU1 and MU2 if required.

If the SQL is on during transmission and reception, both MU1 and MU2 are "high"; if the SQL is off during reception, both MU1 and MU2 are "low". When the MPU outputs a logical high signal, muting takes place.

MU1 turns the AF PA AMP power supply on and off through Q3 : DTC144EK in MODULE UNIT (AF) : Z3, and MU2 turns the AF signal line on and off through Q5 : DTC143TU in the TX-RX unit to control muting operations.

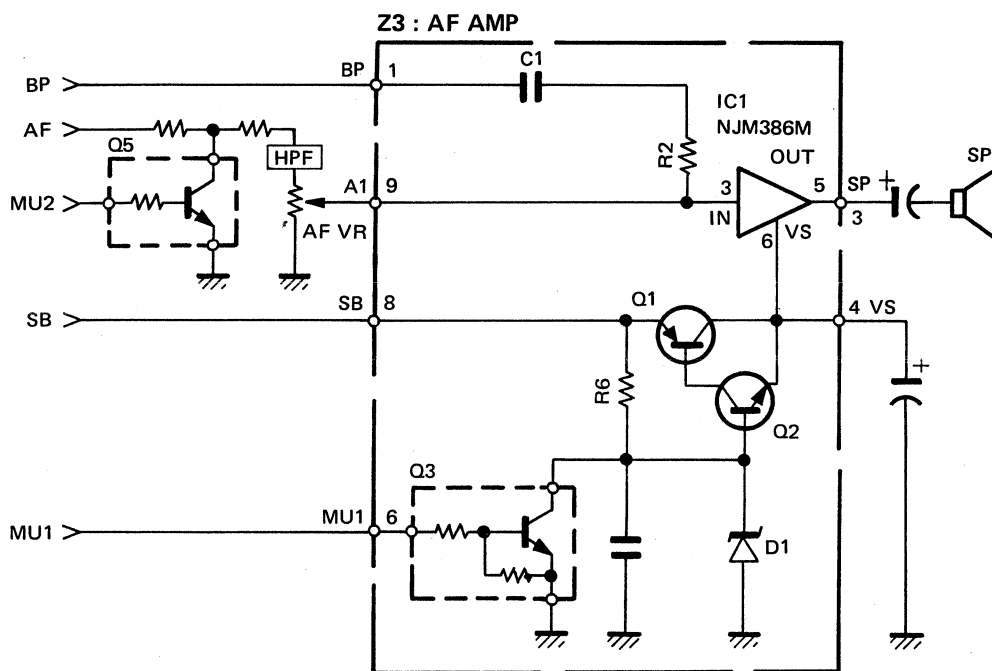


Fig. 2 Noise squelch circuit

CIRCUIT DESCRIPTION

2. TX Unit

Transmission frequencies are obtained by generating signals with half the desired frequency with the VCO, Q3 : 2SC3838K, in SUB UNIT (PLL) : Z8. The output from the VCO is amplified to the required level by the AMP Q2 : 2SC3356 and further amplified by AMP Q1 : 2SC3356. Undesired signals are removed by the BPF, and the resulting signal is output. The signal passes through SW, D2 : HSM2693, and enters MODULE UNIT (DRIVE) : Z5. It is amplified by two RF amplifiers, Q1 : 2SC4093 and Q2 : 2SC2954, in Z5 and further amplified by the RF power module, IC1 : M57797H. The signal passes through the antenna changeover switch, D1 : MI308, and the BPF and is supplied to the antenna.

• Modulation Circuit

The AF signal from the microphone is pre-emphasized and fed to the MODULE UNIT (MIC AMP) : Z4. The signal passes through the modulation limiting amplifier, which uses the power supply voltage of the first operational amplifier, IC1 (1/2) : NJM4560, for amplitude limiting. It then passes through the splatter filter (18dB/oct), composed of an active LPF (12dB/oct) formed by the second operational amplifier, IC1 (2/2) : NJM4560, and a LPF (6dB/oct) formed by R15 and C11.

Next, it passes through the variable resistor, VR1, for modulation adjustment, and is output to the MOD pin. This signal enters the SUB UNIT (PLL) : Z8, is applied to the VCO variable capacitance diode D2 : MA344B, and is phase modulated for transmission by variable reactance.

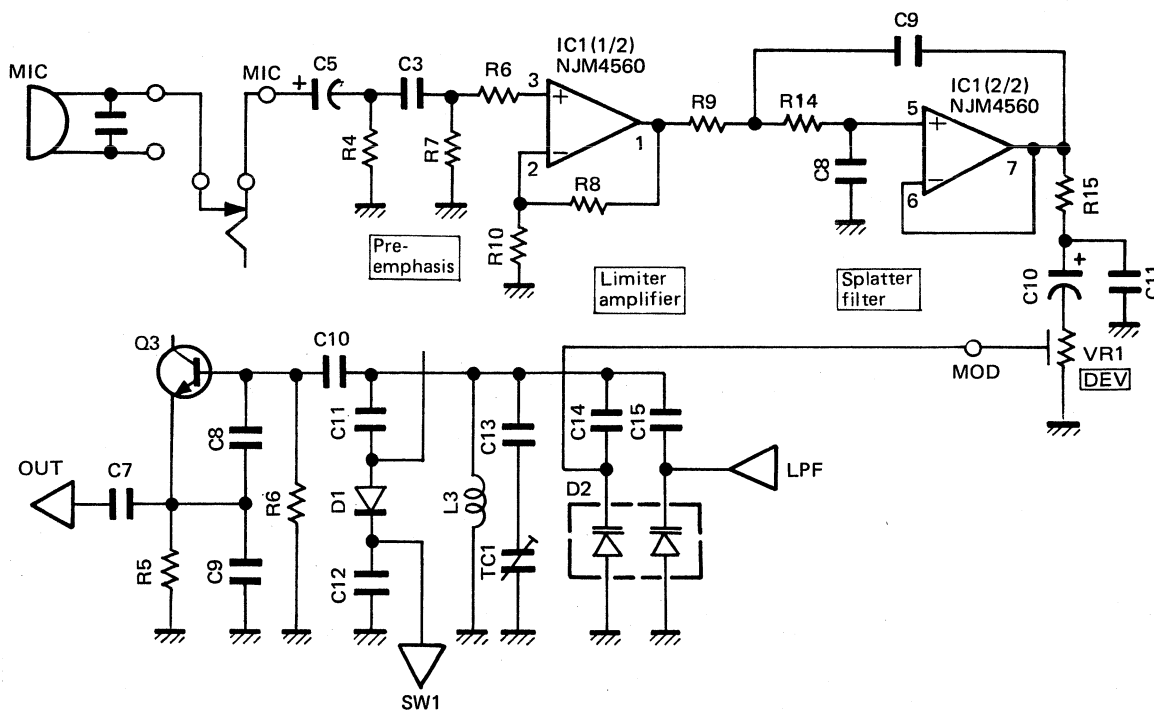


Fig. 3 Modulation circuit

• Drive and Final Circuit

The modulated signal from the SUB UNIT (PLL) : Z8 enters the drive unit, passes through the transmit/receive changeover switch D2 : HSM2693, and enters the MODULE UNIT (DRIVE) : Z5. The signal is then amplified by the RF amplifiers Q1 : 2SC4093 and Q2 : 2SC2954. The APC output voltage is controlled by varying the collector voltages of the drive transistors, Q1 and Q2. The drive output is further amplified by the RF power module, IC1 : M57797H, and supplied to the ANT through the antenna changeover switch D1 : MI308, and BPF.

CIRCUIT DESCRIPTION

● APC Circuit

The APC circuit operates by measuring the collector current at the first and last stages of the final module by the voltage drop across R4 in SUB UNIT (APC) : Z6. The comparator IC1 : LM301AD, compares this voltage with the voltage established by the zener diode D1 : 02CZ3.9Y,Z, which is divided by R9, the POWER adjustment volume control and R10. The comparator output

passes through Q8 : 2SB1182(Q) and changes the collector voltages of the drive transistors, Q1 : 2SC4093 and Q2 : 2SC2954, of MODULE UNIT (DRIVE) : Z5, to keep the current of the final module constant. This function maintains stable transmission power. The operation keeps the current of the final module constant even if the final module or ANT is faulty.

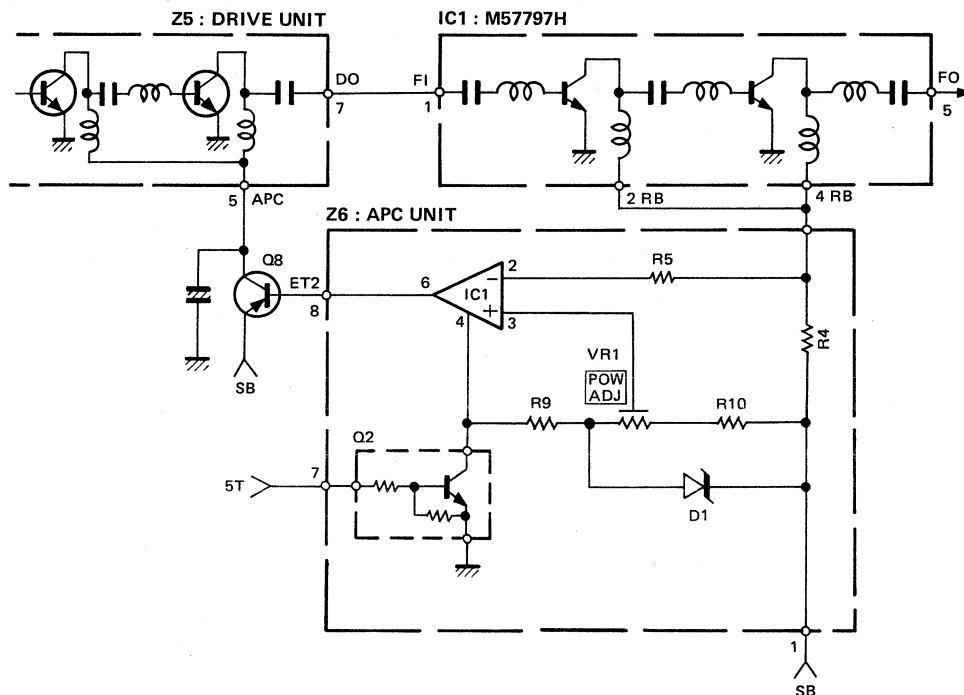


Fig. 4 APC circuit

● BPF Circuit

The filters for spurious radiation suppression include an HPF with an attenuation point of about 230MHz, which is 1/2 the desired frequency produced by the VCO, and a LPF that removes harmonics. With the spurious characteristics of the output of the power module, a value of 65dB or more is obtained.

3. PLL Unit

The SUB UNIT (PLL) : Z8 contains the VCO, Q3 : 2SC3838K, which is used for both transmission and reception. The AMP, LPF and control sections are also used for both transmission and reception. The 12.8MHz frequency of the reference oscillator is divided down to 1/2048 of the reference value to produce a comparison frequency of 6.25kHz.

The transmit signal (450.0000 to 469.9875MHz) and RX 1st local signal (415.1750 to 435.1625MHz) are produced by generating a signal with half the desired frequency with the VCO, Q3, and amplifying the signal with AMP Q2 : 2SC3356, so doubling the frequency. The transmit/receive changeover signal, SW1, is output from pin 10 of IC51 :

The VCO output is amplified by the RF amplifier Q2, further amplified by the RF amplifier Q1, and output to the LO terminal. Part of the Q2 output passes through BUFFER, Q51 : 2SC3356, and is input to pin 1 of the PLL IC, IC51.

This single-chip IC (IC51) incorporates two modular prescalers of 1/128 and 1/129 and implements a PLL of the dual modulus type. IC51 also contains a phase comparator. The output (pin 13, PD) whose phase is compared passes through the active LPF consisting of Q52 : XN6501 and is applied to the variable capacitance diode D2 : MA344B of the VCO circuit. The PLL general division ratio M is expressed by the following equation :

$$M = A + 128N$$

Where

A is the dual modulus counter division ratio

N is the main counter division ratio

A and N are received from the MPU (IC2 in the control unit) as serial data. A and N for transmission are different from those for reception. Therefore, the general division ratio M for transmission is different from that for reception. This data is stored in the 21-bit shift register in IC51.

CIRCUIT DESCRIPTION

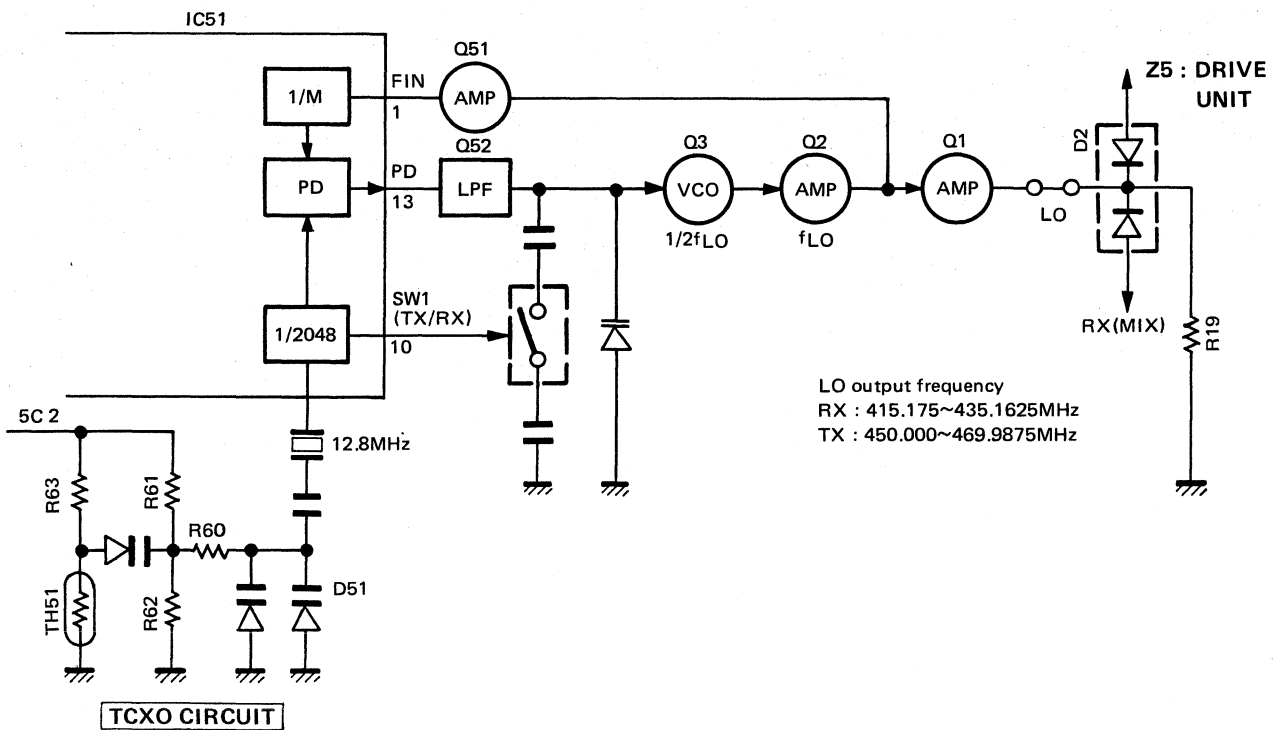


Fig. 5 PLL block diagram

• TCXO Circuit

A 12.8MHz reference signal is generated by connecting the X'tal to the generation circuit in IC51. The X'tal has a frequency stability of $\pm 3\text{ppm}$ in the range -10°C to $+60^{\circ}\text{C}$. When the temperature is -10°C , the frequency stability is corrected by a temperature correction circuit consisting of thermistor TH51 and diode D51 : MA344B. Therefore, the frequency stability is $\pm 5\text{ppm}$ in the range -30°C to $+60^{\circ}\text{C}$.

When the temperature is between -10°C and $+60^{\circ}\text{C}$, the constant voltage divided by R61 and R62 is applied to D51. When the temperature is below -10°C , the temperature corrected voltage divided by TH51 and R63 is applied to D51.

• UNLOCK Circuit

When the PLL is unlocked, the UNLOCK signal (UL terminal) from the PLL IC IC51 : M54959FP, "opens" pin 29 (TX) of the MPU, IC2 : $\mu\text{PD75108AG}$, in the control unit, pulling the TX terminal of SUB UNIT (AVR) : Z7 to high. This controls the transmission power supply with Q2 : 2SA1313(Y) and Q5 : 2SB1218 in Z7. The 5V line (5T) from MODULE UNIT (DRIVE) : Z5, is turned off to suppress transmission output.

CIRCUIT DESCRIPTION

4. Power Supply Circuit

The power supply circuit provides the power supply voltage (SB) and, using the SUB UNIT (AVR) : Z7, provides 5V (5T) for transmission, 5V (5R) for reception, 5V (5C) for transmission and reception, and 5V (5M) for the micro-processor and MIC by the SUB UNIT (AVR) : Z7 to operate the circuits.

Switching between 5T and 5R is done by the TX signal on pin 29 (TX) of the MPU, IC2 : μ PD75108AG in the control unit. For 5T, pin 29 (TX) of the MPU and the TX terminal of SUB UNIT (AVR) : Z7, go low during transmission, so Q5 : 2SB1218 and Q2 : 2SC1313(Y) turn on and output the 5C voltage to the 5T terminal. Pin 29 (TX) of the MPU is "open" and the TX terminal of SUB UNIT (AVR) : Z7, goes high during reception, and therefore, Q1 : 2SD1819 and Q3 : DTA113ZU turn on, and the 5C voltage is output to the 5R terminal.

The 5V for 5C is generated by the 3-terminal regulator, IC1 : LP2950CZ, differential amplifier, IC2 : IMX1, and Q8 : 2SB1182(Q) in the TX-RX unit, which is outside the SUB UNIT (AVR) : Z7.

The 5M voltage is output from IC1.

• Battery Saving

The battery saving function is provided to reduce current consumption when the system is waiting for a signal. The battery saving operations are controlled by the control signals output from pin 3 (SAVE) of the MPU according to the conditions. When this signal is output, all the power supplies except the 5V (5M) for the MPU and MIC are turned off. The save operation is performed intermittently for about 200ms (normal) when the battery saving function is on (SV terminal low), and for about 800ms (save) when the function is off (SV terminal high).

The save operation starts when the squelch is closed for 10 seconds or more and no key operation is performed. Then, when a signal is received, the squelch is opened, or a key operation is performed, normal operation resumes.

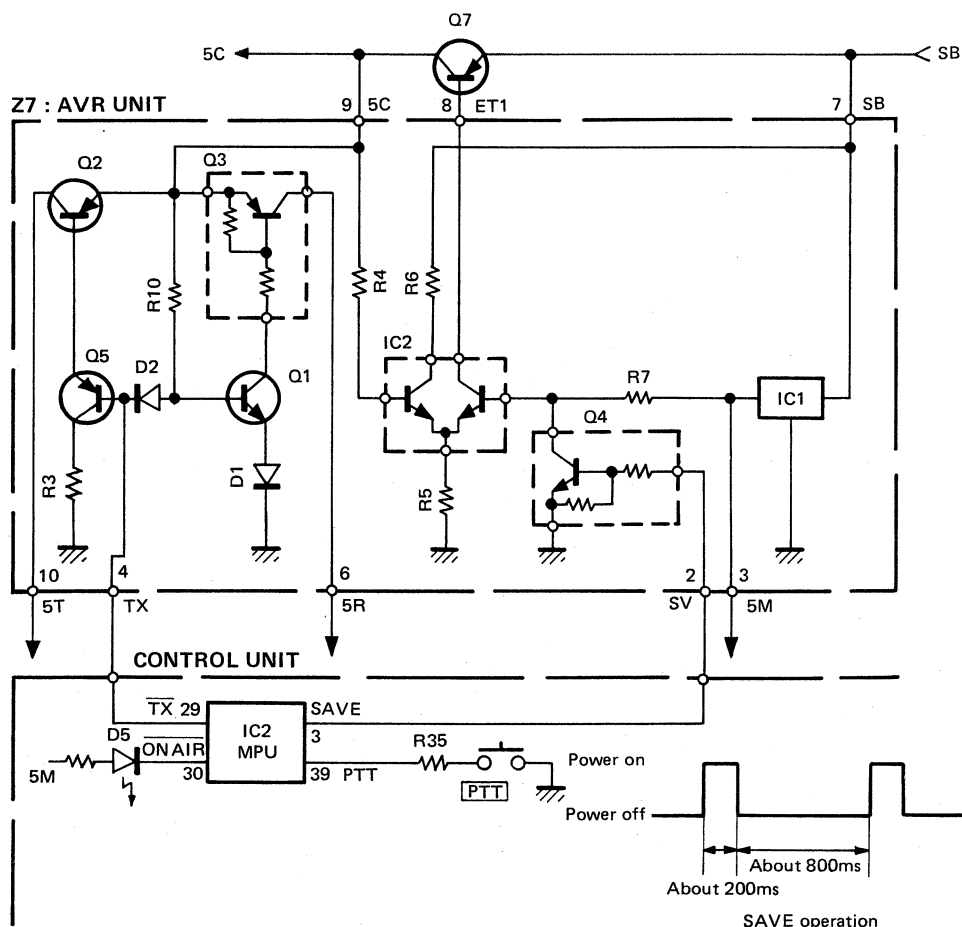


Fig. 6 Power supply circuit

CIRCUIT DESCRIPTION

Control Unit

The control unit consists of a 4-bit, single-chip MPU, IC2 : μ PD75108AG ; an LCD driver IC1 : LH5008TP ; a reset circuit, Q1 : 2SC2712(Y) ; a backup circuit, IC3 : S8054ALR ; and an EEPROM, IC4 : 93C46PI, which stores channel frequency information.

1. Channel Frequency and Tone (TX/RX) Setting

Transmit and receive frequencies and tones are loaded into memory channels 1 to 16 of the EEPROM, IC4 : 93C46PI, by operating the rotary encoder, PTT, MONI, and LAMP. After the power is switched off, and the internal jumper is cut the EEPROM enters its operating mode, and can be used by switching the CH selector with the rotary encoder.

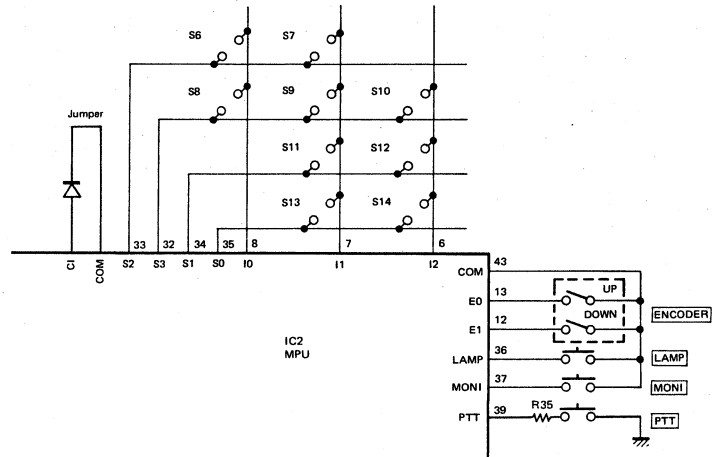


Fig. 7 Keyboard

2. Reset and Backup Circuit

The reset and backup circuit is controlled by the 5M voltage. The MPU is reset by a "L" pulse applied to its RESET pin (pin 54 of IC2 : μ PD75108AG) by C1 and Q1 : 2SC2712(Y). This pulse is generated when the power switch is pressed. For backup, when the 5M voltage falls below about 4.5V, the IC3 : S8054ALR output goes "L". The MPU receives this output through the VF pin (IC2 pin 27) and enters the backup mode.

When the 5M voltage increases suddenly, the MPU is reset by the reset circuit of C1 and Q1. When the voltage rises gradually, the leading edge at which the IC3 output changes from low to high is detected, and the MPU is reset.

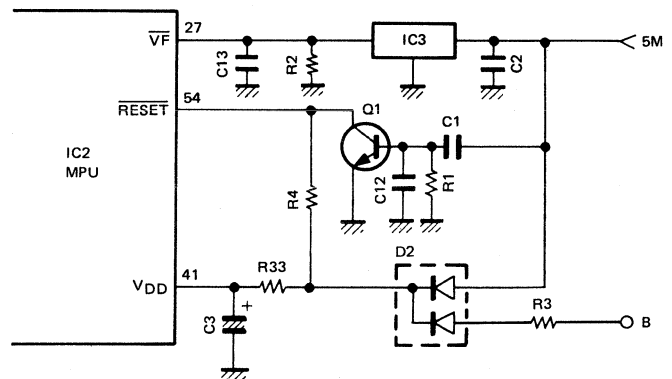


Fig. 8 Reset and backup circuit

CTCSS Unit

The CTCSS unit checks whether the received subtone matches the receive tone frequency stored in the CH memory, and enables receive operation if it does. The unit generates the transmit tone frequency stored in the CH memory during transmission. Serial data is sent to the shift register, IC2 : MN4049BS, from the MPU (control unit IC2 : μ PD75108AG) via the clock (CT), data (DT), and enable (ET) pins, and is converted to parallel data. Thus, it is possible to set the tone frequency of the TONE SQL IC, IC1 : MN6520, switch between transmission and reception, and switch IC1 power on and off.

1. Tone Decode Section

Part of the AF signal detected by SUB UNIT (IF) : Z2, is input from the CI terminal of the CTCSS unit, pass through the BUFFER AMP Q3 : 2SC2712(GR), and is applied to TONE SQL IC, IC1 : MN6520. This signal passes

through the LPF in IC1, which only passes signals below a cutoff frequency, and is fed to the limiter. A check is made to see whether the receive subtone from the MPU matches the set frequency. If it does, the SDO terminal of the CTCSS unit goes high; otherwise, it stays low. This signal is sent to the MPU (control unit IC2), which determines the current conditions, and if necessary, outputs mute signals MU1 and MU2 to perform muting.

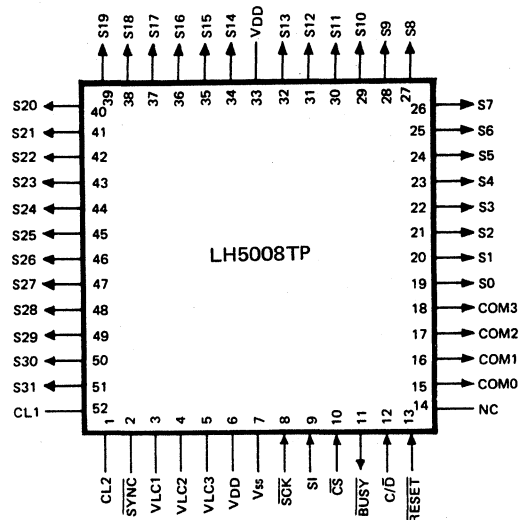
2. Tone Encode Section

The MPU transmits the send tone frequency and send instruction, and pin 12 (TX) of IC1 : MN6520 in the CTCSS unit goes low and a tone signal is output from pin 26 (TX OUT) to the TO terminal through the variable resistor VR1, which allows tone deviation adjustment. The signal is then mixed with the audio signal from the SUM terminal of MODULE UNIT (MIC AMP) : Z4, and modulated.

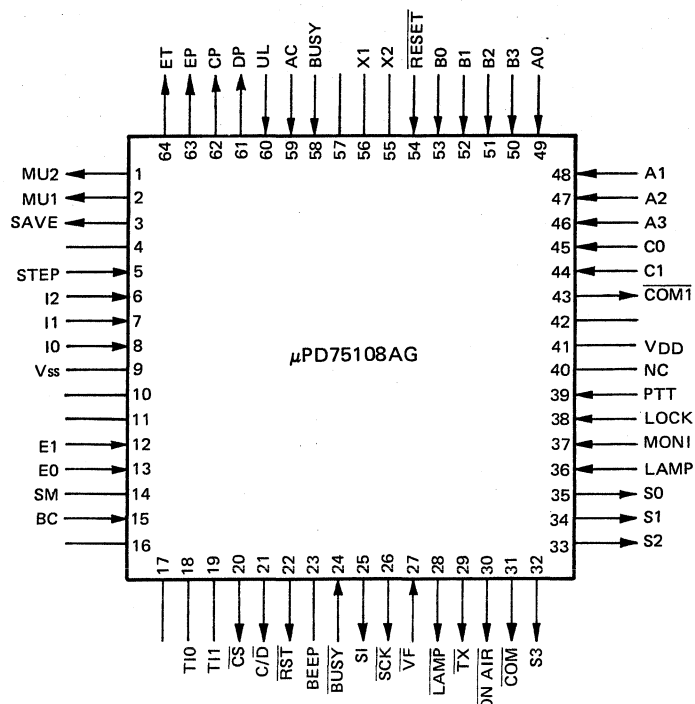
SEMICONDUCTOR DATA

LH5008TP (Control unit IC1)

● Terminal connection diagram

 μ PD75108AG (Control unit IC2)

● Terminal connection diagram



● Terminal functions (LH5008TP)

Pin No.	Name	I/O	Function
1	CL2	—	Internal clock oscillation resistance pin.
2	SYNC	—	Not used.
3, 4	VLC1, VLC2	—	LCD driver power supply.
5	VLC3	—	Ground.
6	VDD	—	+5V power supply.
7	VSS	—	Ground.
8	SCK	I	Shift clock input.
9	SI	I	Serial data input.
10	CS	I	Enable input. "L" : Data input enabled, "H" : Contents of the memory are output
11	BUSY	O	Data input control. "L" : Inhibit, "H" : Permit
12	C/D	I	Input data identification input. "L" Data, "H" : Command
13	RESET	I	Reset input.
14	NC	—	
15 ~ 17	COM0 ~ COM2	O	Common drive output.
18	COM3	O	Not used.
19 ~ 32	S0 ~ S13	O	Segment drive output.
33	VDD	—	+5V power supply.
34 ~ 45	S14 ~ S25	O	Segment drive output.
46 ~ 51	S26 ~ S31	O	Not used.
52	CL1	—	Internal clock oscillation resistance pin.

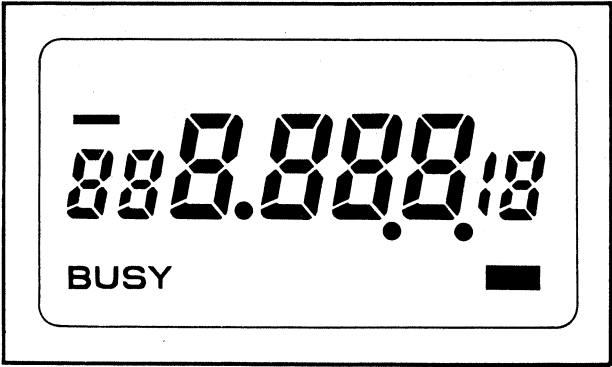
SEMICONDUCTOR DATA

● Terminal functions (μPD75108AG)

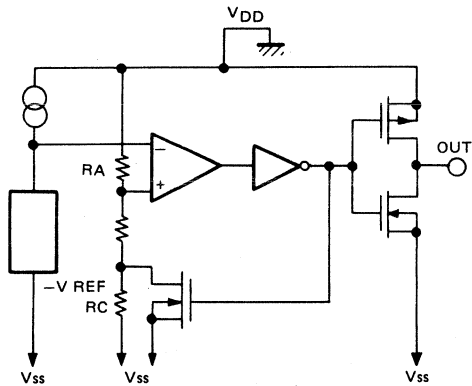
Pin No.	Name	I/O	During save	Function
1	MU2	O	L	AF input line control. "L" : OFF, "H" : ON
2	MU1	O	H	AF amplifier power control. "L" : OFF, "H" : ON
3	SAVE	O	H	Power save control. "L" : OFF, "H" : ON
4	—	—	—	
5	STEP	I	—	Save control. "L" : OFF, "H" : ON
6	I2	I	—	Key matrix input.
7	I1	I	—	Key matrix input.
8	I0	I	—	Key matrix input.
9	Vss	—	—	Ground.
10, 11	—	—	—	Ground.
12	E1	I	—	Encoder input. DOWN
13	E0	I	—	Encoder input. UP
14	SM	—	—	
15	BC	I	—	Battery voltage check.
16, 17	—	—	—	Ground.
18	TI0	—	—	Ground.
19	TI1	—	—	Ground.
20	\overline{CS}	O	H	LCD driver control output.
21	C/\overline{D}	O	H	LCD driver control output.
22	\overline{RST}	O	H	LCD driver control output.
23	BEEP	—	—	
24	BUSY	I	—	LCD driver control output.
25	SI	O	—	LCD driver control output.
26	\overline{SCK}	O	—	LCD driver control output.
27	\overline{VF}	I	—	Perform backup operation when the 5M voltage drops.
28	\overline{LAMP}	O	H	Lamp ON/OFF control. "L" : ON, "H" : OFF
29	\overline{TX}	O	H	Transmit/receive switching. "L" : Transmit, "H" : Receive
30	ON AIR	O	H	ON AIR display output. "L" : ON, "H" : OFF
31	\overline{COM}	O	L	"L" : normal, "H" : during save or backup.
32	S3	O	L	Key matrix output. MHz, VFO, MR
33	S2	O	L	Key matrix output. TONE, T.ALT
34	S1	O	L	Key matrix output. M, SHIFT
35	S0	O	L	Key matrix output. CTCSS, REV
36	LAMP	I	—	Lamp switch control. "L" : SW ON, "H" : SW OFF
37	MONI	I	—	Monitor switch control. "L" : SW ON, "H" : SW OFF
38	LOCK	I	—	Lock switch control. "L" : SW ON, "H" : SW OFF
39	PTT	I	—	PTT switch control. "L" : SW ON, "H" : SW OFF
40	NC	—	—	Open.
41	VDD	—	—	+5V power supply.
42	—	—	—	Ground.
43	$\overline{COM1}$	O	L	
44	C1	I	H	Mode switching. "L" : Mode used, "H" : Mode set up.
45	C0	I	—	DATA input (from EEPROM).
46 ~ 48	A3 ~ A1	O	—	EEPROM DATA (A3), CLOCK (A2) ENABLE (A1).
50 ~ 53	B3 ~ B0	I	—	Destination.
54	\overline{RESET}	I	—	System reset.
55	X2	—	—	
56	X1	—	—	
57	—	—	—	Open.
58	BUSY	I	—	Busy control. "L" : Open, "H" : Busy
59	AC	I	—	Tone squelch control input. "L" : No match, "H" : Match
60	UL	I	—	Unlock input. "L" : Lock, "H" : Unlock
61	DP	O	L	PLL, TONE data.
62	CP	O	L	PLL, TONE clock.
63	EP	O	L	PLL enable.
64	ET	O	L	CTCSS enable.

SEMICONDUCTOR DATA

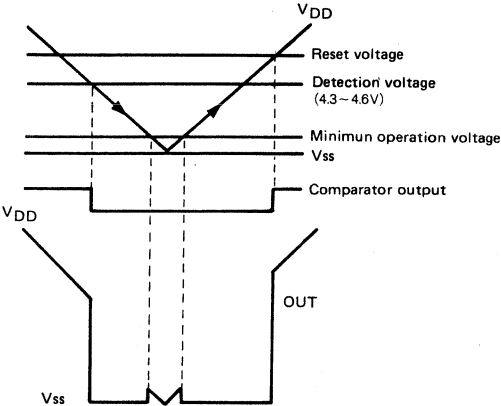
FTD8608 (Control unit LCD)
● All lighting



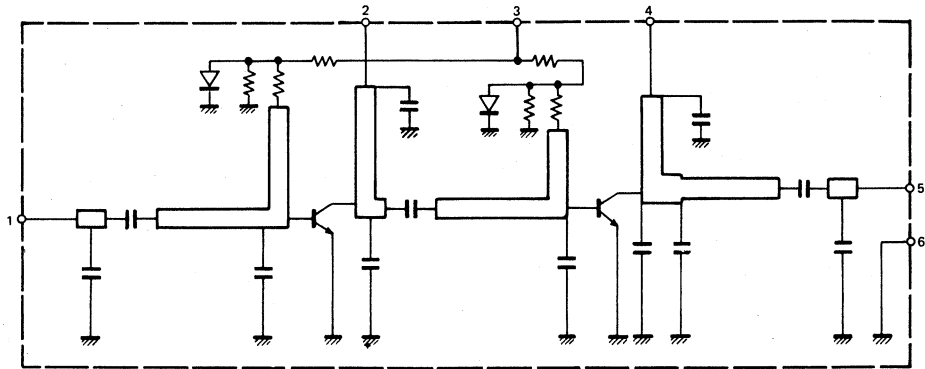
S8054ALR (Control unit IC3)
● Block diagram



● Timing chart



M57797H (TX-RX unit IC1)
● Equivalent circuit



● Electrical characteristics

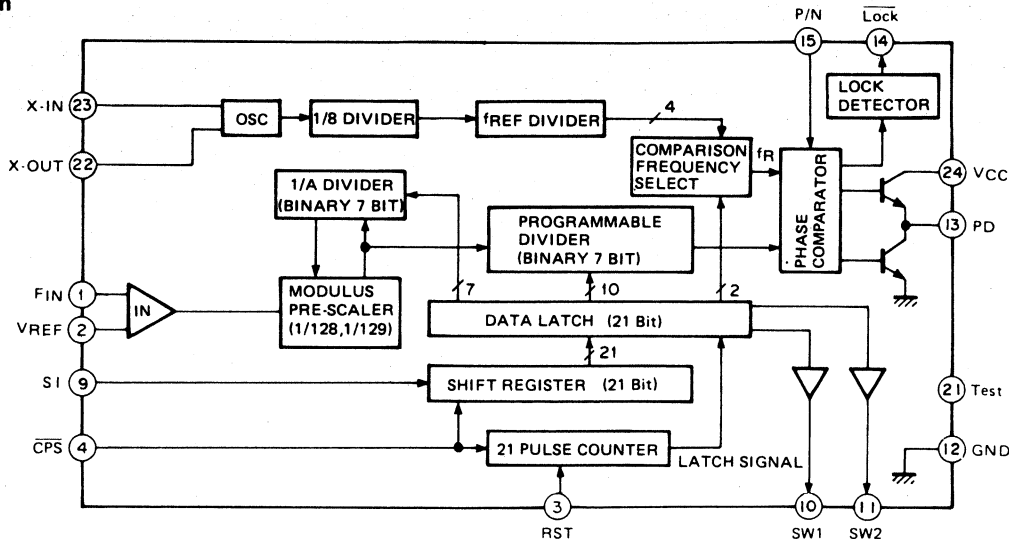
Item	Symbol	Rating			Unit	Condition
		MIN.	TYP.	MAX.		
Output power	Po	7	8	—	W	Tc = 25°C
Total efficiency	ηT	40	50	—	%	Vcc = 12.5V
2nd spurious				-25	dB	VBB = 5V
Spurious after 3rd				-30	dB	F = 450 ~ 470MHz
Output SWR	ρ out		1.5	—	—	Pin = 0.2W
Input SWR	ρ in			2.5	—	ZG = ZL = 50Ω
Operating voltage	Vcc			16	V	

- 1 : Input
- 2 : Pre-drive + B
- 3 : Bias + B
- 4 : Final + B
- 5 : Output
- 6 : GND (Fin)

SEMICONDUCTOR DATA

M54959FP (PLL unit IC51)

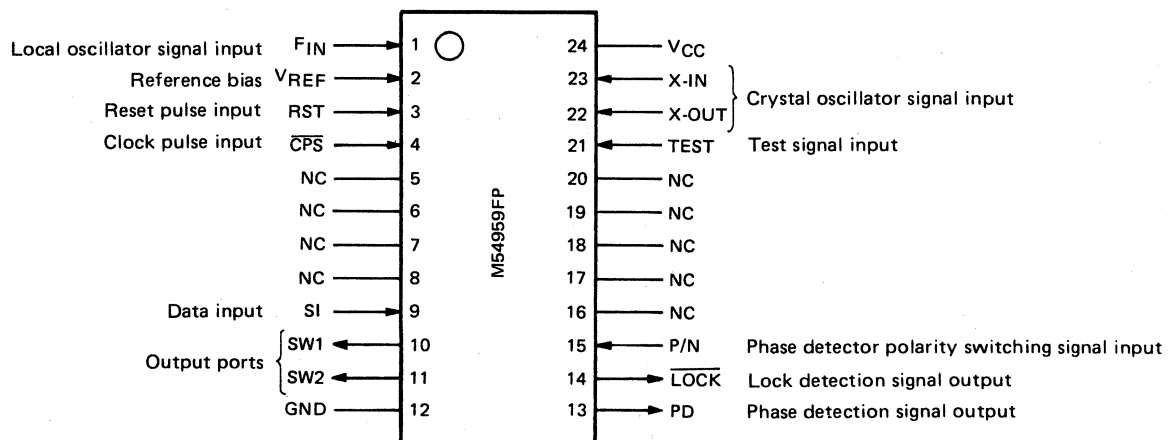
- **Block diagram**



● Description of terminals

No.	Symbol	Pin name	Description
1	FIN	Local oscillator signal input	Local oscillator frequency (VCO) input. fMAX = 500MHz.
2	VREF	Reference bias	Grounded by a 1000pF capacitor.
3	RST	Reset pulse input	Reset pulse input for 21-pulse counter.
4	CPS	Clock pulse input	Clock pulse input for shift register.
5 ~ 8	NC	Not connected	Use for open or ground.
9	SI	Data input	Data input for shift register.
10	SW1	Output ports	Output ports whose status is determined by the data sent from the controller. Open collector.
11	SW2		
12	GND	Ground	0V.
13	PD	Phase detection signal output	Tristate.
14	LOCK	Lock detection signal output	"L" when the PLL unit is locked, "H" when it is unlocked. Open collector.
15	P/N	Phase detector polarity switching	When this pin is "H", the PD pin is "H" for phase lead and "L" for phase delay. When this pin is "L", the PD pin is "L" for phase lead and "H" for phase delay.
16 ~ 20	NC	Not connected	Use for open or ground.
21	TEST	Test signal input	Usually "L". When this pin is "H", fR (comparison frequency) and fIN/N (programmable divider) are output from SW1 (pin 10) and SW2 (pin 11), respectively.
22	X-OUT	Liquid crystal oscillator signal input	Inputs signals sent from the 12.8MHz basic oscillator to X-IN. Oscillation is possible even when an external crystal resonator is used.
23	X-IN		
24	VCC	Power supply	4.5 ~ 5.5V.

- **Terminal connection diagram**

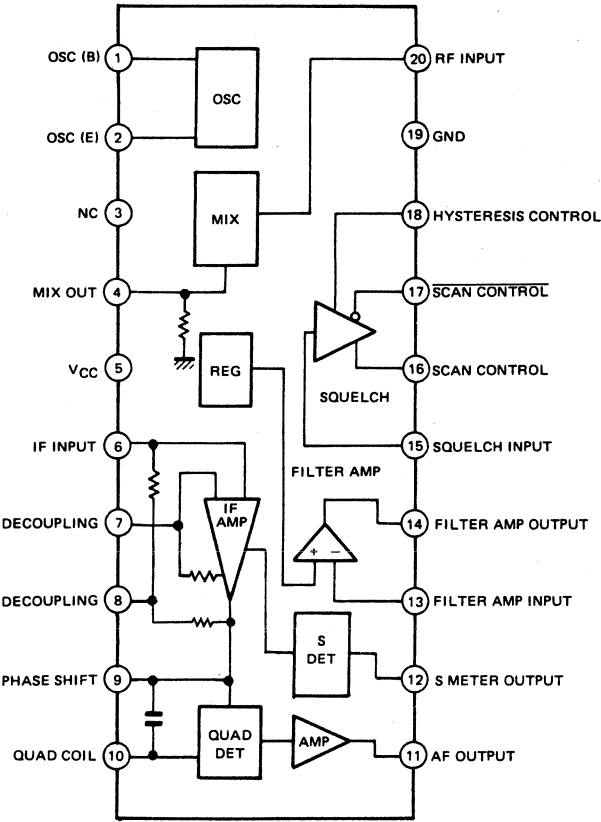


NC : Not connected

SEMICONDUCTOR DATA

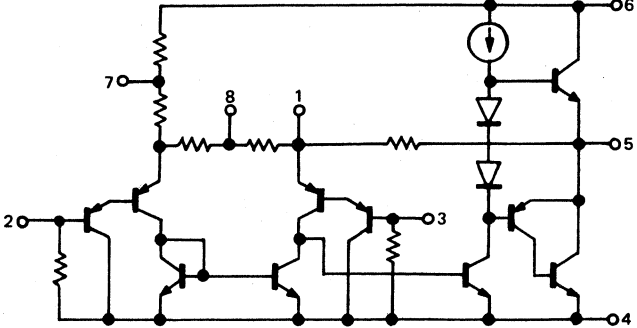
TK10485MT1 (IF unit IC1)

● Block diagram



NJM386BM (AF AMP. unit IC1)

● Equivalent circuit



● Electrical characteristics

Item	Symbol	Rating			Unit	Condition
		MIN.	TYP.	MAX.		
Supply voltage	V _s	4	—	18	V	
Output power	P _{out}	500	850	—	mW	V _s = 9V, R _L = 8Ω, THD = 10%
Voltage gain	A _v		46		dB	f = 1kHz, Between 1 and 8 : Connect capacitor (10μF).
Bandwidth	BW		600		kHz	Between 1 and 8 : Open.
Distortion	THD		0.2		%	f = 1kHz, P _{out} = 125mW, R _L = 8Ω
Input resistance	R _{IN}		50		kΩ	

DESCRIPTION OF COMPONENTS

SIGNALING UNIT (X52-3090-11) : TK-320(DM) ONLY

Component	Part No.	Function
Q1	2SC2712(GR)	
IC1	LR40872	

CTCSS UNIT (X52-3100-00) : K TYPE ONLY

Component	Part No.	Function
Q1	DTC144TK	Switch.
Q2	DTA114EK	Switch.
Q3	2SC2712(GR)	Buffer amp.
IC1	MN6520	Tone squelch system.
IC2	MN4094BS	Register.

CONTROL UNIT (X53-3170-10)

Component	Part No.	Function
Q1	2SC2712(Y)	Switch.
Q2	2SA1162(Y)	Switch.
IC1	LH5008TP	LCD driver.
IC2	μPD75108AG-029-22	MPU.
IC3	S8054ALR-LN	Voltage detector.
IC4	93C46PI	EEPROM.
D1, 2	1SS184	Switch.
D5	SLH34VC3	TX indicator.
D6, 7	LN01301C(Q)	LCD lamp.

TX-RX UNIT (X57-3150-XX)

Component	Part No.	Function
Q1, 2	2SC4093	RF amp.
Q3	2SC3356	Mixer.
Q4	2SC2714(Y)	IF amp.
Q5	DTC143TU	Switch.
Q7	2SB1182(Q)	AVR.
Q8	2SB1182(Q)	APC.
Q9	DTC143TK	
Q101	2SC4116(GR)	High pass filter.
IC1	M57797H	RF power amp.
D1	MI308	Antenna switch.
D2	HSM2693	Switch.
D4	HSM88AS	RF limiter.
D5	MA856	Switch.

PLL : Z8 (X58-3080-11)

Component	Part No.	Function
Q1, 2	2SC3356	Buffer amp.
Q3	2SC3838K	VCO.
Q51	2SC3356	Buffer amp.
Q52	XN6501	Low pass filter.
IC51	M54959FP	PLL frequency synthesizer.
D1	HSK277	Switch.
D2	MA344B	Frequency control.
D51	MA344B	Temperature compensation.

AVR : Z7 (X58-3200-10)

Component	Part No.	Function
Q1	2SD1819	Switch.
Q2	2SA1313(Y)	Switch (AVR).
Q3	DTA113ZU	Switch (AVR).
Q4	DTC144EU	Switch.
Q5	2SB1218	Switch.
IC1	LP2950CZ	AVR.
IC2	IMX1	Switch (AVR control).
D1, 2	MA110	Level shift.

IF : Z2 (X58-3210-12)

Component	Part No.	Function
Q1	2SC2712(GR)	Noise amp.
IC1	TK10485MT1(B,C)	FM IF system.
D1	HSN88AS	Noise rectification.

APC : Z6 (X58-3220-11)

Component	Part No.	Function
Q2	DTC114TK	Switch.
IC1	LM301AD	DC amp.
D1	02CZ3.9Y,Z	Constant-voltage diode.
D2	1SS268	Temperature compensation.

ANT SW : Z1 (X58-3270-10)

Component	Part No.	Function
D1, 2	HSK277	Antenna switch.

DRIVE : Z5 (X59-3290-11)

Component	Part No.	Function
Q1	2SC4093	Power amp. driver.
Q2	2SC2954	Power amp. driver.
D1	1SS226	Temperature compensation.

MIC AMP : Z4 (X59-3300-11)

Component	Part No.	Function
IC1	NJM4560	Mic amp., splatter filter.

AF AMP : Z3 (X59-3310-10)

Component	Part No.	Function
Q1	2SB1182(F5)Q	AVR.
Q2	2SC2712(GR)	AVR.
Q3	DTC144EK	Switch.
IC1	NJM386BM	AF power amp.
D1	02CZ6.8X	Constant-voltage diode.

PARTS LIST

CAPACITORS

CC 45 TH 1H 220 J
1 2 3 4 5 6

- 1 = Type ceramic, electrolytic, etc. 4 = Voltage rating
2 = Shape round, square, etc. 5 = Value
3 = Temp. coefficient 6 = Tolerance

• Temperature Coefficient

1st Word	C	L	P	R	S	T	U
Color*	Black	Red	Orange	Yellow	Green	Blue	Violet
ppm/°C	0	-80	-150	-220	-330	-470	-750

• Tolerance

Code	C	D	G	J	K	M	X	Z	P	No code
(%)	± 0.25	± 0.5	± 2	± 5	± 10	± 20	+ 40 - 20	+ 80 - 20	+ 100 - 0	More than Less than 10μF-10~+50 4.7μF-10~+75

Less than 10 pF

• Rating voltage

2nd word 1st word	A	B	C	D	E	F	G	H	J	K	V
0	1.0	1.25	1.6	2.0	2.5	3.15	4.0	5.0	6.3	8.0	—
1	10	12.5	16	20	25	31.5	40	50	63	80	35
2	100	125	160	200	250	315	400	500	630	800	—
3	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	—

• Chip capacitors

(EX) CC 7 3 F SL 1 H 0 0 0 J
1 2 3 4 5 6 7
(Chip) (CH, RH, UJ, SL)
(EX) CK 7 3 F F 1 H 0 0 0 Z
1 2 3 4 5 6 7
(Chip) (B, F)

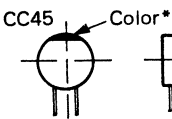
RESISTORS

• Chip resistor (Carbon)

(EX) RD 7 3 E B 2 B 0 0 0 J
1 2 3 4 5 6 7
(Chip) (B, F)

• Carbon resistor (Normal type)

RD 1 4 B B 2 C 0 0 0 J
1 2 3 4 5 6 7



• Capacitor value

- 0 1 0 = 1pF
1 0 0 = 10pF
1 0 1 = 100pF
1 0 2 = 1000pF = 0.001μF

1 0 3 = 0.01μF

2 2 0 = 22pF
1st number | Multiplier
2nd number

Example CC45TH = -470±60 ppm/°C

Code	B	C	D	F	G
(pF)	± 0.1	± 0.25	± 0.5	± 1	± 2

Dimension

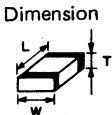
Dimension code	L	W	T
Empty	5.6 ± 0.5	5.0 ± 0.5	Less than 2.0
E	3.2 ± 0.2	1.6 ± 0.2	Less than 1.25
F	2.0 ± 0.3	1.25 ± 0.2	Less than 1.25

Dimension

Dimension code	L	W	T	Wattage
E	3.2 ± 0.2	1.6 ± 0.2	0.57	2B
F	2.0 ± 0.3	1.25 ± 0.2	0.45	2A

Rating wattage

Cord	Wattage	Cord	Wattage	Cord	Wattage
2A	1/10W	2E	1/4W	3A	1W
2B	1/8W	2H	1/2W	3D	2W
2C	1/6W				



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TK-320						
1	3B		A01-1038-02	METALLIC CABINET(REAR)		
4	1A	*	A02-0849-04	PLASTIC CABINET(FRONT)		A
4	1A	*	A02-0850-04	PLASTIC CABINET(FRONT)		B
5	2B		A11-0405-04	SUB CHASSIS ASSY(VOL)		
6	2B		A11-0406-04	SUB CHASSIS ASSY(ENCODER)		
7	2A	*	A20-2626-03	PANEL		
10	3B		A40-0621-04	BOTTOM PLATE		
		*	B09-0311-03	CAP (SP,MIC)		
			B42-2454-04	S/NØ LABEL (ITEM CARTON BOX)		
			B46-0409-20	WARRANTY CARD		
16	2A		B10-0698-04	FRONT GLASS		
17	2A		B11-0449-04	REFLECTOR		
18	3B	*	B40-3838-04	MODEL NAME PLATE		
20	3B		B42-2437-04	S/NØ LABEL (RADIO)		
-			B03-0547-04	DRESSING PLATE		B
-		*	B50-8172-00	INSTRUCTION MANUAL		
C1			CC73FCH1H390J	CHIP C 39PF J		
C2			CK45B1H121K	CERAMIC 120PF K		
C3			CK45B1H101K	CERAMIC 100PF K		
			E31-3279-25	CONNECTING WIRE(QT/CTCSS)		
			E31-3332-05	CONNECTING WIRE(TX-RX-JACK)		
30	3B		E04-0168-05	RF COAXIAL CABLE RECEPTACLE		
31	3B		E23-0494-14	DC INPUT TERMINAL(-)		
37	3B		E23-0607-04	TERMINAL (BNC)		
38	3B		E23-0605-14	DC INPUT TERMINAL(+)		
			F10-1360-04	SHIELDING PLATE(TX-RX)		
39	3B	*	F19-0660-04	BLIND PLATE (REAR)		
40	3B	*	F19-0661-04	BLIND PLATE (BOTTOM PLATE)		A
40	3B	*	F19-0662-04	BLIND PLATE (BOTTOM PLATE)		B
41	3B	*	F20-1010-04	INSULATING SHEET(REAR)		
46	2B		F10-1364-14	SHIELDING PLATE(R)		
47	1B		F10-1365-14	SHIELDING PLATE		
48	2B		F11-1097-04	SHIELDING COVER(MODULE)		
49	1A		F19-0658-04	BLIND PLATE (MIC JACK)		
51	3B		F20-0593-14	INSULATING SHEET(TX-RX)		
52	2A		F20-0594-04	INSULATING SHEET(CONTROL)		
53	1A		F20-0596-04	INSULATING SHEET(JACK)		
54	3B		F29-0435-05	INSULATOR (BELT HOOK)		
56	2B		F20-1009-04	INSULATING SHEET(SHIELDING PLT)		
			G10-0665-04	FELT (CTCSS)	K	
			G10-0666-04	FELT (QT/CTCSS)	K	
58	2A		G02-0505-05	LEAF SPRING (VOL, ENCODER)		
59	1A		G10-0657-04	FELT (SP)		
59	1A		G10-0664-04	FELT (SP)		A
60	3B		G13-0852-04	CUSHION (BATT TERMINAL)		
61	2B	*	G13-0900-04	CUSHION		
62	3B		G16-0514-04	SHEET (R)		
63	1A		G53-0508-04	NON WOVEN FABRIC(3P)		B
			H11-0808-14	POLYSTURENE FOAMED PLATE		
			H13-0801-04	PROTECTION PLATE		
			H13-0818-04	PROTECTION PLATE		

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--		*	H01-8113-02 H10-2635-02 H21-0715-04 H25-0085-04	ITEM CARTON BOX POLYSTYRENE FOAMED FIXTURE PROTECTION SHEET PROTECTION BAG (100X200)		
79	3B		J21-4223-04 J29-0424-04 J19-1426-03	MOUNTING HARDWARE(CASE) BELT HOOK ASSY HOLDER (BATT TERMINAL)		
80	2B		J21-4219-14	MOUNTING HARDWARE(MODULE)		
82	1A		J21-4221-04	MOUNTING HARDWARE(SP)		
83	1A		J21-4222-04	MOUNTING HARDWARE(SP, MIC JACK)		
86	1A		J30-0547-04	SPACER (SP)		
87	1A		J31-0526-14	MIC SPACER		
88	2A		J69-0311-05	RING (BNC)		
91	1A		J30-0548-04	SPACER (SP)		B
96	2A		K29-3096-04	KN0B (VOL)		
97	2A		K29-3097-04	KN0B (SQL)		
98	2A		K29-3098-04	KN0B (ENCODER)		
99	3B		K29-3100-04	KN0B (RELEASE)		
100	3B		K29-3102-03	KN0B (PTT)		
103	1A		K29-3105-04	KN0B		B
104	2A		N14-0534-04	NUT (VOL, ENCODER)		
A	1B		N09-0663-04	SCREW (PANEL, CONTROL)		
B	3B		N09-2022-05	SCREW (M2X4) BOTTOM PLATE		
C	1A, 3B		N09-2023-05	SCREW (M2X3) BNC		
D	3B		N09-2024-05	SCREW (Ø2X16) CASE, R, F		
E	3B		N09-2025-05	SCREW (Ø1.7X3)		
F	1A		N09-2026-05	SCREW (Ø2X3.5) SP		
G	3B		N09-2028-05	SCREW (M3X4) BELT HOOK		
J	2B		N30-2005-41	PAN HEAD MACHINE SCREW(TX-RX)		
K	3B		N33-2005-45	OVAL HEAD MACHINE SCREW(BNC)		
L	1B, 2B		N35-2003-41	BINDING HEAD MACHINE SCREW		
M	3B	*	N09-2036-05	SCREW (M2X5)		
R1			RD14BB2B333J	RD 33K J 1/8W		B
111	1D	*	T90-0365-05	ANTENNA (ASSY)		
113	1A		T07-0251-05	LOUDSPEAKER(FULLRANGE)		
	1A		T91-0372-05	MICROPHONE		
D4			1SS133	DIODE		
			W09-0508-05	BATTERY PACK (KNB-5)		
126	2A	*	X52-3100-00	QT/CTCSS UNIT	K	
127	1A, 2B	*	X53-3170-10	CONTROL UNIT		B
127	1A, 2B	*	X57-3150-12	TX-RX UNIT		A
127	1A, 2B	*	X57-3150-13	TX-RX UNIT		B
128	1A	*	X52-3090-11	SIGNALING UNIT		B
SIGNALING UNIT (X52-3090-11)						
C1			CE04CWOJ100M	ELECTRO 10UF 6.3WV		
C2			CK73FB1H102K	CHIP C 1000PF K		
C3			CK73EB1E104K	CHIP C 0.10UF K		
C4			C92-0005-05	CHIP-TAN 2.2UF 6.3WV		
C5			CK73FB1H332K	CHIP C 3300PF K		
C6			C92-0009-05	CHIP TAN 4.7UF 10WV		
C7	, 8		CK73FB1H102K	CHIP C 1000PF K		

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C9			C92-0008-05	CHIP TAN 3.3UF 16WV		
L1			L78-0035-05	RESONATOR		
R2			RK73FB2A154J	CHIP R 150K J 1/10W		
R3			RK73FB2A122J	CHIP R 1.2K J 1/10W		
R4			RK73FB2A563J	CHIP R 56K J 1/10W		
R5			RK73FB2A101J	CHIP R 100 J 1/10W		
R6			RK73FB2A472J	CHIP R 4.7K J 1/10W		
R9			R92-0670-05	CHIP R 0 OHM		
VR1			R12-3460-05	TRIMMING PQT. (33K)		
IC1			LR40872	IC(TONE DIALER)		
Q1			2SC2712(GR)	CHIP TRANSISTOR		
QT/CTCSS UNIT (X52-3100-00)						
C1			CK73FB1H102K	CHIP C 1000PF K		
C2			C92-0010-05	CHIP TAN 6.8UF 6.3WV		
C3			C90-2082-05	TANTAL 22UF 4WV		
C4 ,5			CK73EB1E104K	CHIP C 0.10UF K		
C6			CK73EB1H223K	CHIP C 0.022UF K		
C7			CK73EB1E104K	CHIP C 0.10UF K		
C8 ,9			CC73FCH1H150J	CHIP C 15PF J		
C10			CK73FB1H102K	CHIP C 1000PF K		
C11			CK73FB1E473M	CHIP C 0.047UF M		
C12			C92-0507-05	CHIP TAN 4.7UF 6.3WV		
C13			C92-0510-05	CHIP TAN 3.3UF 4WV		
CN1			E40-5121-05	PIN CONNECTOR (10P)		
W1			E33-1836-00	FINISHED WIRE SET		
X1			L77-1313-05	CRYSTAL RESONATOR(4.19430MHZ)		
R1			RK73FB2A102J	CHIP R 1.0K J 1/10W		
R2			RK73FB2A103J	CHIP R 10K J 1/10W		
R3			RK73FB2A183J	CHIP R 18K J 1/10W		
R4			RK73FB2A123J	CHIP R 12K J 1/10W		
R5			RK73FB2A103J	CHIP R 10K J 1/10W		
R6			RK73FB2A222J	CHIP R 2.2K J 1/10W		
R7			RK73FB2A154J	CHIP R 150K J 1/10W		
R8			RK73FB2A823J	CHIP R 82K J 1/10W		
R9 ,10			RK73FB2A103J	CHIP R 10K J 1/10W		
R11			R92-0670-05	CHIP R 0 OHM		
R12			RK73FB2A562J	CHIP R 5.6K J 1/10W		
R13			RK73FB2A392J	CHIP R 3.9K J 1/10W		
R14			RK73FB2A105J	CHIP R 1.0M J 1/10W		
VR1			R12-3460-05	TRIMMING PQT. (33K)		
IC1			MN6520	IC(CTCSS SYSTEM)		
IC2			MN4094BS	IC(8BIT SHIFT,STORE BASS R)		
Q1			DTC144TK	DIGITAL TRANSISTOR		
Q2			DTA114EK	DIGITAL TRANSISTOR		
Q3			2SC2712(GR)	CHIP TRANSISTOR		
CONTROL UNIT (X53-3170-10)						
A1	2A		A33-0409-04	REFLECTOR (LCD)		
C1			CK73FB1H223K	CHIP C 0.022UF K		
C2			CK73FB1H103K	CHIP C 0.010UF K		
C3			C92-0010-05	CHIP TAN 6.8UF 6.3WV		

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C4 C5 -7 C11 C12 ,13 C14			CK73FB1H102K CK73FB1H103K CC73FCH1H101J CC73FCH1H101J CK73FB1H471K	CHIP C 1000PF K CHIP C 0.010UF K CHIP C 100PF J CHIP C 100PF J CHIP C 470PF K		
A4	2A		E29-0478-04 G16-0524-04	CONNECTOR (LCD) SHEET		
A2	2A		J21-4220-04	MOUNTING HARDWARE (LCD)		
X1			L78-0036-05	RESONATOR (4.19MHZ)		
R1 R2 R3 R4 R5			RK73FB2A563J RK73FB2A183J RK73FB2A824J RK73FB2A473J RK73FB2A472J	CHIP R 56K J 1/10W CHIP R 18K J 1/10W CHIP R 820K J 1/10W CHIP R 47K J 1/10W CHIP R 4.7K J 1/10W		
R6 R8 R9 R10 R11 -15			RK73FB2A473J RK73FB2A331J RK73FB2A562J RK73FB2A103J RK73FB2A473J	CHIP R 47K J 1/10W CHIP R 330 J 1/10W CHIP R 5.6K J 1/10W CHIP R 10K J 1/10W CHIP R 47K J 1/10W		
R16 R17 R23 R25 -27 R32			RK73FB2A184J RK73FB2A390J R92-0670-05 R92-0670-05 RK73FB2A102J	CHIP R 180K J 1/10W CHIP R 39 J 1/10W CHIP R 0 0HM CHIP R 0 0HM CHIP R 1.0K J 1/10W		
R33 -35			R92-0670-05	CHIP R 0 0HM		
S1 -3			S40-1420-05	TACT SWITCH		
A3 D1 ,2 D5 D6 ,7 IC1	2A 2A		FTD-8608 1SS184 SLH34VC3 LN01301C(Q) LH5008TP	LCD CHIP DIODE LED (TX) LED (LCD) IC(LCD CONTROLLER/ DRIVER)		
IC2 IC3 IC4		*	75108AG-029-22 S8054ALR-LN 93C46P1 or 93C46PIJAP1	IC(MICROPROCESSOR) IC IC(1K EEPROM)		
Q1			2SC2712(Y)	CHIP TRANSISTOR		
Q2			2SA1162(Y)	CHIP TRANSISTOR		
EN1			W02-0825-05	ENCODER		
TX-RX UNIT (X57-3150-XX) -12 : TK-320(DM) -13 : TK-320						
C1 C2 C3 C4 ,5 C7 -12			CC73FCH1H050C CC73FCH1H120J CC73FCH1H070D CC73FCH1H050C CK73FB1H471K	CHIP C 5.0PF C CHIP C 12PF J CHIP C 7.0PF D CHIP C 5.0PF C CHIP C 470PF K		
C13 C14 C15 C16 C17			CC73FCH1H010C CC73FRH1H390J CK73FB1H471K CC73FCH1H090D C90-2050-05	CHIP C 1.0PF C CHIP C 39PF J CHIP C 470PF K CHIP C 9.0PF D ELECTRO 33UF 6.3WV		

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C18			CK73FB1H471K	CHIP C 470PF K		
C19			C90-2053-05	ELECTR0 47UF 6.3WV		
C20			C90-2058-05	ELECTR0 47UF 10WV		
C21			C90-2052-05	ELECTR0 68UF 10WV		
C22			CK73FB1H471K	CHIP C 470PF K		
C24			CE04CW0J100M	ELECTR0 10UF 6.3WV		
C25			C90-2073-05	ELECTR0 6.8UF 16WV		
C26			C90-2017-05	ELECTR0 100UF 6.3WV		
C28			C92-0005-05	CHIP-TAN 2.2UF 6.3WV		
C29 ,30			C90-2017-05	ELECTR0 100UF 6.3WV		
C31			CK73EF1C105Z	CHIP C 1.0UF Z		
C32			CK73FB1H102K	CHIP C 1000PF K		
C40			C90-2073-05	ELECTR0 6.8UF 16WV		
C41 ,42			CK73FB1H471K	CHIP C 470PF K		
C43			CK73FB1H102K	CHIP C 1000PF K		
C44			CK73FB1H471K	CHIP C 470PF K		
C45			CK73FB1H103K	CHIP C 0.010UF K		
C46			C90-2073-05	ELECTR0 6.8UF 16WV		
C47			CE04CW1H010M	ELECTR0 1.0UF 50WV		
C48			C90-2049-05	ELECTR0 15UF 6.3WV		
C49			CC73FCH1H270J	CHIP C 27PF J		
C51 -55			CK73FB1H471K	CHIP C 470PF K		
C56			C92-0005-05	CHIP-TAN 2.2UF 6.3WV		
C57			CK73FB1H471K	CHIP C 470PF K		
C58			C91-0430-05	MYLAR 0.047UF K		
C59			CK73FB1H102K	CHIP C 1000PF K		B
C60			CC73FCH1H470J	CHIP C 47PF J		
C61			CC73FCH1H220J	CHIP C 22PF J		
C64 ,65			CC73FCH1H101J	CHIP C 100PF J		
C101			CK73FB1E473M	CHIP C 0.047UF M		
C102			CK73FB1E223K	CHIP C 0.022UF K		
C103			CK73FB1E273K	CHIP C 0.027UF K		
C104			C90-0896-05	ELECTR0 47UF 16WV		
C105			CK73FB1H103K	CHIP C 0.010UF K		
C106			CK73FB1H471K	CHIP C 470PF K		
C107			CK73FB1H471K	CHIP C 470PF K		
C108			CK45B1H471K	CERAMIC 470PF K		
C109			CK73FB1H471K	CHIP C 470PF K		
C110			CK73FB1E473M	CHIP C 0.047UF M		
C111			CK45B1H471K	CERAMIC 470PF K		
C112			CK73FB1H471K	CHIP C 470PF K		
CN1			E40-5128-05	FPC CONNECTOR (20P)		
CN2			E40-5127-05	PIN CONNECTOR (7P)		
CN4			E40-5127-05	PIN CONNECTOR (7P)		
CN6			E40-5126-05	PIN CONNECTOR (7P)		
J1			E11-0421-05	PHONE JACK		
J2			E11-0420-15	MIC JACK		
W2			E31-3295-25	CONNECTING WIRE		
W3			E31-3296-05	CONNECTING WIRE		B
W3			E31-3335-15	CONNECTING WIRE		A
			F20-0597-04	INSULATING BOARD		
			J30-0545-05	SPACER (CRYSTAL)		
			J30-0551-04	SPACER (POWER MODULE)		

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L1 ,2			J31-0503-05	COLLAR (CRYSTAL)		
L3		*	L34-1213-05	COIL		
L4			L34-1227-05	COIL		
L5			L40-1092-17	SMALL FIXED INDUCTOR(1UH)		
L6			L40-1872-80	SMALL FIXED INDUCTOR(18NH)		
L7			L79-0832-05	FILTER		
L8			L40-1872-80	SMALL FIXED INDUCTOR(18NH)		
L9			L79-0833-05	FILTER		
L10 ,11			L34-4058-05	COIL		
L12			L40-1021-14	SMALL FIXED INDUCTOR (1MH)		
X1			L40-3301-14	SMALL FIXED INDUCTOR(33UH)		
XF1 ,2			L77-1382-05	CRYSTAL RESONATOR(34.370MHZ)		
			L71-0284-05	CRYSTAL FILTER (34.825MHZ)		
R1			RK73FB2A331J	CHIP R 330 J 1/10W		
R2			RK73FB2A274J	CHIP R 270K J 1/10W		
R3			RK73FB2A220J	CHIP R 22 J 1/10W		
R4			RK73FB2A561J	CHIP R 560 J 1/10W		
R5			RK73FB2A474J	CHIP R 470K J 1/10W		
R6			RK73FB2A220J	CHIP R 22 J 1/10W		
R7			RK73FB2A561J	CHIP R 560 J 1/10W		
R8			RD14BB2B332J	RD 3.3K J 1/8W		
R9			RK73FB2A334J	CHIP R 330K J 1/10W		
R10 ,11			RK73FB2A561J	CHIP R 560 J 1/10W		
R12			RK73FB2A334J	CHIP R 330K J 1/10W		
R13			R92-0670-05	CHIP R 0 OHM		
R14			RK73FB2A332J	CHIP R 3.3K J 1/10W		
R15			RK73FB2A471J	CHIP R 470 J 1/10W		
R16			RK73FB2A221J	CHIP R 220 J 1/10W		
R17 ,18			RK73FB2A102J	CHIP R 1.0K J 1/10W		
R19			RK73FB2A822J	CHIP R 8.2K J 1/10W		
R20			RK73FB2A332J	CHIP R 3.3K J 1/10W		
R25			RK73FB2A473J	CHIP R 47K J 1/10W		
R28			RK73FB2A100J	CHIP R 10 J 1/10W		
R29			RD14BB2B332J	RD 3.3K J 1/8W		
R30			RK73FB2A473J	CHIP R 47K J 1/10W		
R31			RK73EB2B101J	CHIP R 100 J 1/8W		
R32			RK73FB2A152J	CHIP R 1.5K J 1/10W		
R33			RK73FB2A153J	CHIP R 15K J 1/10W		
R34			RK73FB2A182J	CHIP R 1.8K J 1/10W		
R35			RD14BB2B332J	RD 3.3K J 1/8W		
R36			RK73FB2A823J	CHIP R 82K J 1/10W		
R37			RD14BB2C101J	RD 100 J 1/6W		
R41 ,42			RK73FB2A103J	CHIP R 10K J 1/10W		
R43			R92-0670-05	CHIP R 0 OHM		
R44 ,45			RK73FB2A103J	CHIP R 10K J 1/10W		
R46			R92-0670-05	CHIP R 0 OHM		
R48			R92-0670-05	CHIP R 0 OHM		
R50			R92-0670-05	CHIP R 0 OHM		
R51			R92-0679-05	CHIP R 0 OHM		
R52			RK73FB2A152J	CHIP R 1.5K J 1/10W		
R101			RK73FB2A392J	CHIP R 3.9K J 1/10W		
R102			RK73FB2A104J	CHIP R 100K J 1/10W		
R103			RK73FB2A472J	CHIP R 4.7K J 1/10W		

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R104 VR5 W1	2B	*	RK73FB2A102J R23-9403-05 R92-1061-05	CHIP R 1.0K J 1/10W POTENTIOMETER(50K/50L,10K/VOL) JUMPER RES 0 OHM		
D1 D2 D4 D5 IC1		*	M1308 HSM2693 HSM88AS MA856 M57797H	DIODE CHIP DIODE CHIP DIODE DIODE IC(POWER MODULE/ 450-470MHZ)		
Q1 ,2 Q3 Q4 Q5 Q7 ,8		*	2SC4093 2SC3356 2SC2714(Y) DTC143TU 2SB1182(Q)	CHIP TRANSISTOR CHIP TRANSISTOR CHIP TRANSISTOR DIGITAL TRANSISTOR TRANSISTOR		
Q9 Q101			DTC143TK 2SC4116(GR)	DIGITAL TRANSISTOR CHIP TRANSISTOR		B
Z1 Z2 Z3 Z4 Z5		*	X58-3270-10 X58-3210-12 X59-3310-10 X59-3300-11 X59-3290-11	SUB UNIT (ANT SW) SUB UNIT (IF) SUB UNIT (AF AMP) SUB UNIT (MIC AMP) SUB UNIT (DRIVE)		
Z6 Z7 Z8		*	X58-3220-11 X58-3200-10 X58-3080-11	SUB UNIT (APC) SUB UNIT (AVR) SUB UNIT (PLL)		
PLL (X58-3080-11)						
C1 C2 C3 C5 C6			CK73FB1H471K CC73FCH1H030C CC73FCH1H150J C92-0507-05 CK73FB1H471K	CHIP C 470PF K CHIP C 3.0PF C CHIP C 15PF J CHIP TAN 4.7UF 6.3WV CHIP C 470PF K		
C7 C8 C9 C10 C11			CC73FCH1H010C CC73FCH1H050C CC73FCH1H080D CC73FUJ1H060D CC73FCH1H040C	CHIP C 1.0PF C CHIP C 5.0PF C CHIP C 8.0PF D CHIP C 6.0PF D CHIP C 4.0PF C		
C12 C13 C14 C15 C16			CC73FCH1H330J CC73FCH1H100D CC73FCH1H0R5C CC73FCH1H150J CK73EB1E563K	CHIP C 33PF J CHIP C 10PF D CHIP C 0.5PF C CHIP C 15PF J CHIP C 0.056UF K		
C17 C18 C19 C20 C21			C92-0003-05 CC73FCH1H101J CK73FB1E103K CC73FCH1H050C CC73FCH1H030C	CHIP TAN 0.47UF 25WV CHIP C 100PF J CHIP C 0.010UF K CHIP C 5.0PF C CHIP C 3.0PF C		
C22 C23 ,24 C25 C26 C27			CC73FCH1H030C CC73FCH1H070D CC73FCH1H060D CK73FB1E103K CK73FB1H102K	CHIP C 3.0PF C CHIP C 7.0PF D CHIP C 6.0PF D CHIP C 0.010UF K CHIP C 1000PF K		
C51 C52 C53 C54 C55 ,56			CK73FB1H471K CC73FCH1H060D CK73FB1H102K CK73FB1H471K CC73FCH1H180J	CHIP C 470PF K CHIP C 6.0PF D CHIP C 1000PF K CHIP C 470PF K CHIP C 18PF J		

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C57			CK73FB1H223K	CHIP C 0.022UF K		
C58			CC73FCH1H101J	CHIP C 100PF J		
C59			CK73FB1E103K	CHIP C 0.010UF K		
C60			CK73FB1H471K	CHIP C 470PF K		
C61			CK73FB1E103K	CHIP C 0.010UF K		
C62			C92-0004-05	CHIP TAN 1UF 16WV		
C63			CK73FB1H222K	CHIP C 2200PF K		
C64			CK73FB1E103K	CHIP C 0.010UF K		
TC1			C05-0346-05	TRIMMING CAP (6PF)		
TC51			C05-0345-05	TRIMMING CAP (10PF)		
CN1			E40-5130-05	PIN CONNECTOR (3P)		
CNS1			E40-5129-05	PIN CONNECTOR (7P)		
			F10-1367-04	SHIELDING PLATE		
			F11-1074-03	SHIELDING COVER		
			F20-0591-04	INSULATING BOARD		
L1			L40-2272-80	SMALL FIXED INDUCTOR		
L3		*	L34-4095-05	COIL		
L4 ,5			L40-3991-19	SMALL FIXED INDUCTOR		
L6 -8			L40-1872-80	SMALL FIXED INDUCTOR		
L51			L40-2272-80	SMALL FIXED INDUCTOR		
X51		*	L77-1383-05	CRYSTAL RESONATOR(12.8MHZ)		
R1			RK73FB2A391J	CHIP R 390 J 1/10W		
R2			RK73FB2A473J	CHIP R 47K J 1/10W		
R3			RK73FB2A102J	CHIP R 1.0K J 1/10W		
R4			RK73FB2A563J	CHIP R 56K J 1/10W		
R5			RK73FB2A561J	CHIP R 560 J 1/10W		
R6 ,7			RK73FB2A472J	CHIP R 4.7K J 1/10W		
R8			RK73FB2A682J	CHIP R 6.8K J 1/10W		
R9			RK73FB2A102J	CHIP R 1.0K J 1/10W		
R10			RK73FB2A472J	CHIP R 4.7K J 1/10W		
R11			RK73FB2A104J	CHIP R 100K J 1/10W		
R12			RK73FB2A224J	CHIP R 220K J 1/10W		
R13			RK73FB2A474J	CHIP R 470K J 1/10W		
R14			RK73FB2A103J	CHIP R 10K J 1/10W		
R15			RK73FB2A183J	CHIP R 18K J 1/10W		
R16			RK73FB2A104J	CHIP R 100K J 1/10W		
R18			RK73FB2A103J	CHIP R 10K J 1/10W		
R53			RK73FB2A471J	CHIP R 470 J 1/10W		
R54 ,55			RK73FB2A104J	CHIP R 100K J 1/10W		
R56 ,57			RK73FB2A272J	CHIP R 2.7K J 1/10W		
R58			RK73FB2A822J	CHIP R 8.2K J 1/10W		
R59			RK73FB2A394J	CHIP R 390K J 1/10W		
R60			RK73FB2A104J	CHIP R 100K J 1/10W		
R61			RK73FB2A823J	CHIP R 82K J 1/10W		
R62			RK73FB2A473F	CHIP R 47K F 1/10W		
R63			RK73FB2A153F	CHIP R 15K F 1/10W		
D1			HSK277	CHIP DIODE		
D2			MA344B	CHIP DIODE		
DS1			MA344B	CHIP DIODE		
ICS1			M54959FP	IC(FREQ SYNTHESIZER PLL)		
Q1 ,2			2SC3356	CHIP TRANSISTOR		
Q3			2SC3838K(P)	CHIP TRANSISTOR		
Q51			2SC3356	CHIP TRANSISTOR		

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Q52 TH51		*	XN6501 157-252-15027	DIGITAL TRANSISTOR THERMISTER (2.5K)		
AVR (X58-3200-10)						
C1			CK73FB1H471K	CHIP C 470PF K		
C2			CK73FB1H103K	CHIP C 0.010UF K		
C3 ,4			CK73FB1H471K	CHIP C 470PF K		
C5			CK73FB1H103K	CHIP C 0.010UF K		
C6			CK73FB1H471K	CHIP C 470PF K		
C8 ,9			CK73FB1H471K	CHIP C 470PF K		
C10 ,11			C92-0004-05	CHIP TAN 1UF 16WV		
C12			CK73FB1H471K	CHIP C 470PF K		
C13			CK73FB1H102K	CHIP C 1000PF K		
C14			CK73EB1E104K	CHIP C 0.10UF K		
C15			CK73FB1H471K	CHIP C 470PF K		
C16			CK73EB1E104K	CHIP C 0.10UF K		
C17			CK73FB1H471K	CHIP C 470PF K		
C18			CK73FB1H102K	CHIP C 1000PF K		
C20			CK73FB1H102K	CHIP C 1000PF K		
C21 -23			CK73FB1H471K	CHIP C 470PF K		
C24			C92-0507-05	CHIP TAN 4.7UF 6.3WV		
C25 ,26			CK73FB1H471K	CHIP C 470PF K		
C27			C92-0501-05	CHIP TAN 1.5UF 6.3WV		
			E23-0610-05	TERMINAL		
L1 ,2			L92-0123-05	BEAD CORE		
R1			RK73FB2A103J	CHIP R 10K J 1/10W		
R2			RK73FB2A473J	CHIP R 47K J 1/10W		
R3			RK73FB2A272J	CHIP R 2.7K J 1/10W		
R4			RK73FB2A472J	CHIP R 4.7K J 1/10W		
R5			RK73FB2A272J	CHIP R 2.7K J 1/10W		
R6			RK73FB2A102J	CHIP R 1.0K J 1/10W		
R7			RK73FB2A472J	CHIP R 4.7K J 1/10W		
R8			RK73FB2A274F	CHIP R 270K F 1/10W		
R9			RK73FB2A124F	CHIP R 120K F 1/10W		
R10			RK73FB2A223J	CHIP R 22K J 1/10W		
R11			R92-0670-05	CHIP R 0 OHM		
R12			RK73FB2A183J	CHIP R 18K J 1/10W		
R13			R92-0679-05	CHIP R 0 OHM		
D1 ,2			MA110	CHIP DIODE		
IC1			LP2950CZ	IC(VOLTAGE REGULATOR/ +5V)		
IC2			IMX1	IC		
Q1			2SD1819	CHIP TRANSISTOR		
Q2			2SA1313(Y)	TRANSISTOR		
Q3			DTA113ZU	DIGITAL TRANSISTOR		
Q5			DTC144EU	DIGITAL TRANSISTOR		
Q5			2SB1218	CHIP TRANSISTOR		
IF (X58-3210-12)						
C1			CK73EB1E104K	CHIP C 0.10UF K		
C2			C92-0004-05	CHIP TAN 1UF 16WV		
C3			C92-0005-05	CHIP-TAN 2.2UF 6.3WV		
C4			CK73FB1E223K	CHIP C 0.022UF K		
C5 -8			CK73FB1H102K	CHIP C 1000PF K		
C10			CK73FB1H102K	CHIP C 1000PF K		

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C11 C14 C15 C16 C17 -19			C92-0001-05 CC73FCH1H470J CC73FCH1H390J CK73FB1H102K CK73EB1E104K	CHIP TAN 0.1UF 35WV CHIP C 47PF J CHIP C 39PF J CHIP C 1000PF K CHIP C 0.10UF K		
C20 C21			CC73FCH1H820J CK73FB1E223K	CHIP C 82PF J CHIP C 0.022UF K		
			E23-0610-05	TERMINAL		
CD1 CF1 L1			L79-0817-05 L72-0362-05 L40-1292-19	CERAMIC DISC CERAMIC FILTER SMALL FIXED INDUCTOR		
R1 R2 R3 R4 R5			RK73FB2A152J RK73FB2A332J RK73FB2A102J RK73FB2A274J RK73FB2A473J	CHIP R 1.5K J 1/10W CHIP R 3.3K J 1/10W CHIP R 1.0K J 1/10W CHIP R 270K J 1/10W CHIP R 47K J 1/10W		
R6 R7 R8 R9 R10			RK73FB2A152J RK73FB2A332J RK73FB2A472J RK73FB2A561J RK73FB2A103J	CHIP R 1.5K J 1/10W CHIP R 3.3K J 1/10W CHIP R 4.7K J 1/10W CHIP R 560 J 1/10W CHIP R 10K J 1/10W		
R11 R12 R14 R15 R16			RK73FB2A122J RK73FB2A222J RK73FB2A681J RK73FB2A101J RK73FB2A562J	CHIP R 1.2K J 1/10W CHIP R 2.2K J 1/10W CHIP R 680 J 1/10W CHIP R 100 J 1/10W CHIP R 5.6K J 1/10W		
D1 IC1 Q1			HSM88AS TK10485MT1(BC) 2SC2712(GR)	CHIP DIODE IC CHIP TRANSISTOR		
APC (X58-3220-11)						
C1 .2 C3 C4 C5 .6			CK73FB1H471K CC73FCH1H151J C92-0005-05 CK73FB1H471K	CHIP C 470PF K CHIP C 150PF J CHIP-TAN 2.2UF 6.3WV CHIP C 470PF K		
			E23-0610-05	TERMINAL		
R3 R4 R5 R6 R7			RK73FB2A683J R92-1203-05 RK73FB2A222J RK73FB2A124J RK73FB2A102J	CHIP R 68K J 1/10W CHIP R 0.22 J 1/2W CHIP R 2.2K J 1/10W CHIP R 120K J 1/10W CHIP R 1.0K J 1/10W		
R8 R9 R10 R11 VR1			RK73FB2A103J RK73FB2A102J RK73EB2B471J R92-0670-05 R12-1439-05	CHIP R 10K J 1/10W CHIP R 1.0K J 1/10W CHIP R 470 J 1/8W CHIP R 0 OHM TRIMMING POT. (4.7K)		
D1 D2 IC1 Q2			D2CZ3.9Y,Z 1SS268 LM301AD DTC114YK	CHIP ZENER DIODE CHIP DIODE IC(OP AMP) DIGITAL TRANSISTOR		
ANT SW (X58-3270-10)						
C1 C2			CC73FCH1H070D CC73FCH1H100D	CHIP C 7.0PF D CHIP C 10PF D		

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C3			CC73FCH1H070D	CHIP C 7.0PF D		
L1 ,2			E23-0610-05	TERMINAL		
D1 ,2			L34-1212-05	CSIL		
			HSK277	CHIP DIODE		
DRIVE (X59-3290-11)						
C1			CC73FCH1H060D	CHIP C 6.0PF D		
C2 ,3			CK73FB1H471K	CHIP C 470PF K		
C4			CC73FCH1H080D	CHIP C 8.0PF D		
C5			CC73FCH1H010C	CHIP C 1.0PF C		
C6			CC73FCH1H020C	CHIP C 2.0PF C		
C7 -9			CK73FB1H471K	CHIP C 470PF K		
C10			CC73FCH1H030C	CHIP C 3.0PF C		
C11			CK73FB1H471K	CHIP C 470PF K		
C12			CC73FCH1H050C	CHIP C 5.0PF C		
C13 -15			CK73FB1H103K	CHIP C 0.010UF K		
			E23-0610-05	TERMINAL		
L1			L40-1072-80	SMALL FIXED INDUCTOR(10NH)		
L2			L40-2272-80	SMALL FIXED INDUCTOR(22NH)		
L3			L40-1872-80	SMALL FIXED INDUCTOR(18NH)		
L4			L40-2272-80	SMALL FIXED INDUCTOR(22NH)		
R1			RK73FB2A101J	CHIP R 100 J 1/10W		
R2			RK73FB2A470J	CHIP R 47 J 1/10W		
R3			RK73FB2A101J	CHIP R 100 J 1/10W		
R4			RK73FB2A471J	CHIP R 470 J 1/10W		
R5			RK73FB2A150J	CHIP R 15 J 1/10W		
R6			RK73FB2A561J	CHIP R 560 J 1/10W		
R7			RK73FB2A471J	CHIP R 470 J 1/10W		
R8			RK73FB2A3R9J	CHIP R 3.9 J 1/10W		
D1			1SS226	CHIP DIODE		
Q1			2SC4093	CHIP TRANSISTOR		
Q2			2SC2954	CHIP TRANSISTOR		
MIC AMP (X59-3300-11)						
C3			CK73FB1E223K	CHIP C 0.022UF K		
C4			CK73FB1H471K	CHIP C 470PF K		
C5			C92-0002-05	CHIP TAN 0.22UF 35WV		
C6			CC73FCH1H020C	CHIP C 2.0PF C		
C7			CK73FB1H102K	CHIP C 1000PF K		
C8			CC73FSL1H151J	CHIP C 150PF J		
C9			CK73FB1H182K	CHIP C 1800PF K		
C10			C92-0507-05	CHIP TAN 4.7UF 6.3WV		
C11			CK73FB1H103K	CHIP C 0.010UF K		
C13			CK73FB1H471K	CHIP C 470PF K		
C14			C92-0507-05	CHIP TAN 4.7UF 6.3WV		
C15			CK73FB1H103K	CHIP C 0.010UF K		
			E23-0610-05	TERMINAL		
R3			RK73FB2A103J	CHIP R 10K J 1/10W		
R4			RK73FB2A272J	CHIP R 2.7K J 1/10W		
R5			R92-0679-05	CHIP R 0.6HM		
R6			RK73FB2A103J	CHIP R 10K J 1/10W		
R7			RK73FB2A472J	CHIP R 4.7K J 1/10W		

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R8			RK73FB2A393J	CHIP R 39K J 1/10W		
R9			RK73FB2A104J	CHIP R 100K J 1/10W		
R10			RK73FB2A391J	CHIP R 390 J 1/10W		
R11			RK73FB2A472J	CHIP R 4.7K J 1/10W		
R12			RK73FB2A223J	CHIP R 22K J 1/10W		
R13			RK73FB2A273J	CHIP R 27K J 1/10W		
R14			RK73FB2A104J	CHIP R 100K J 1/10W		
R15			RK73FB2A472J	CHIP R 4.7K J 1/10W		
R16			RK73FB2A562J	CHIP R 5.6K J 1/10W		
R17			RK73FB2A563J	CHIP R 56K J 1/10W		
R18			RK73FB2A332J	CHIP R 3.3K J 1/10W		
R19			RK73FB2A222J	CHIP R 2.2K J 1/10W		
R20			R92-0679-05	CHIP R 0 OHM		
R21			R92-0670-05	CHIP R 0 OHM		
VR1			R12-6407-05	TRIMMING PØT. (470K)		
IC1			NJM4560M	IC(OP AMP X2)		
TH1			159-252-83003	THERMISTER (2.5K)		
AF AMP (X59-3310-10)						
C1			CK73FB1H102K	CHIP C 1000PF K		
C2			CK73FB1H103K	CHIP C 0.010UF K		
C3			CK73FB1E473M	CHIP C 0.047UF M		
C4			C92-0501-05	CHIP TAN 1.5UF 6.3WV		
C5			CK73FB1H102K	CHIP C 1000PF K		
C6			CK73FB1E473M	CHIP C 0.047UF M		
C7			CK73FB1H103K	CHIP C 0.010UF K		
C8			C92-0004-05	CHIP TAN 1UF 16WV		
			E23-0610-05	TERMINAL		
R1			RK73FB2A222J	CHIP R 2.2K J 1/10W		
R2			RK73FB2A473J	CHIP R 47K J 1/10W		
R3			RK73FB2A273J	CHIP R 27K J 1/10W		
R4			RK73FB2A331J	CHIP R 330 J 1/10W		
R5			RK73FB2A100J	CHIP R 10 J 1/10W		
R6			RK73FB2A103J	CHIP R 10K J 1/10W		
D1			02CZ6.8X	CHIP ZENER DIODE		
IC1			NJM386BM	IC(OP AMP)		
Q1			25B1182(F5)Q	CHIP TRANSISTOR		
Q2			25C2712(GR)	CHIP TRANSISTOR		
Q3			DTC144EK	DIGITAL TRANSISTOR		

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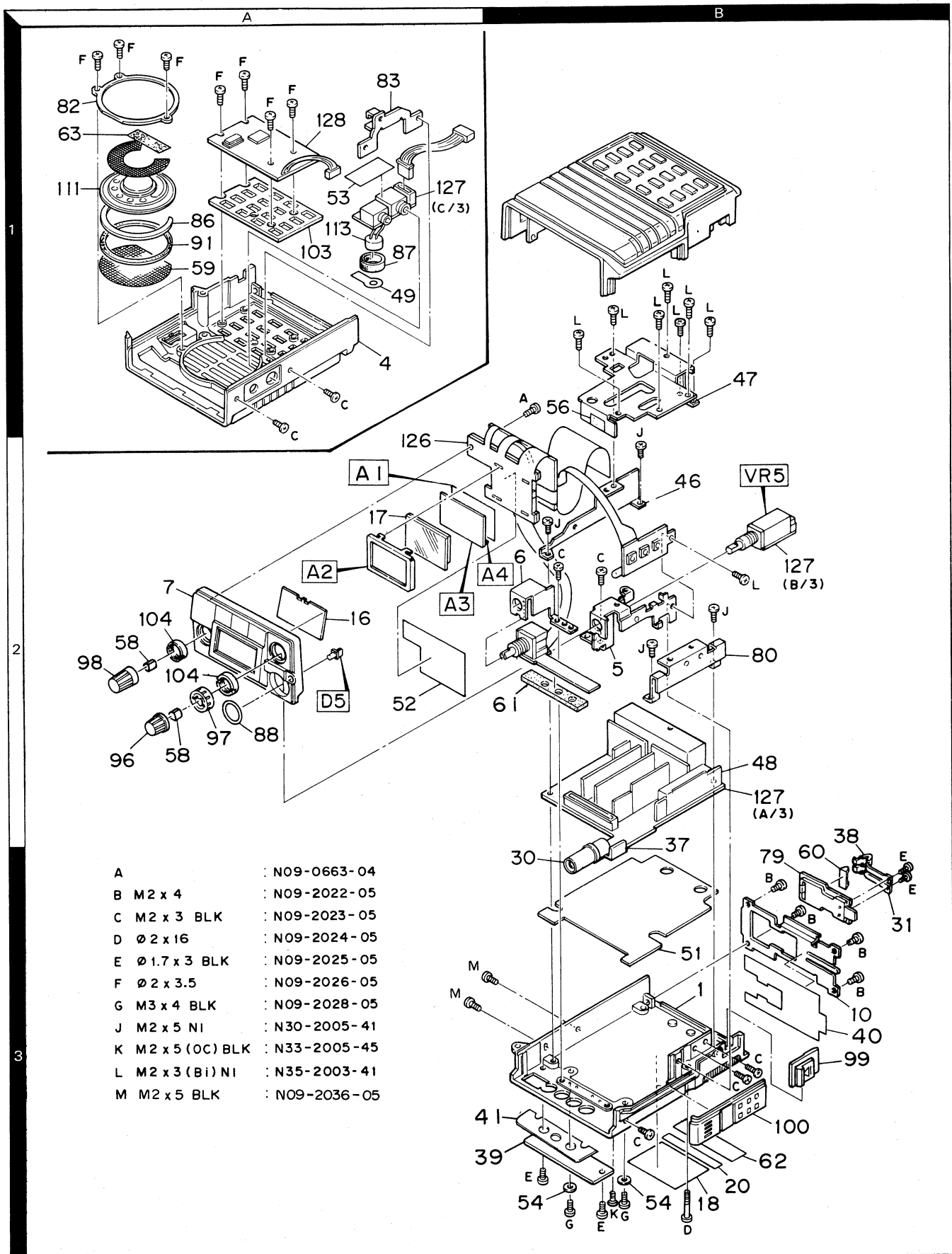
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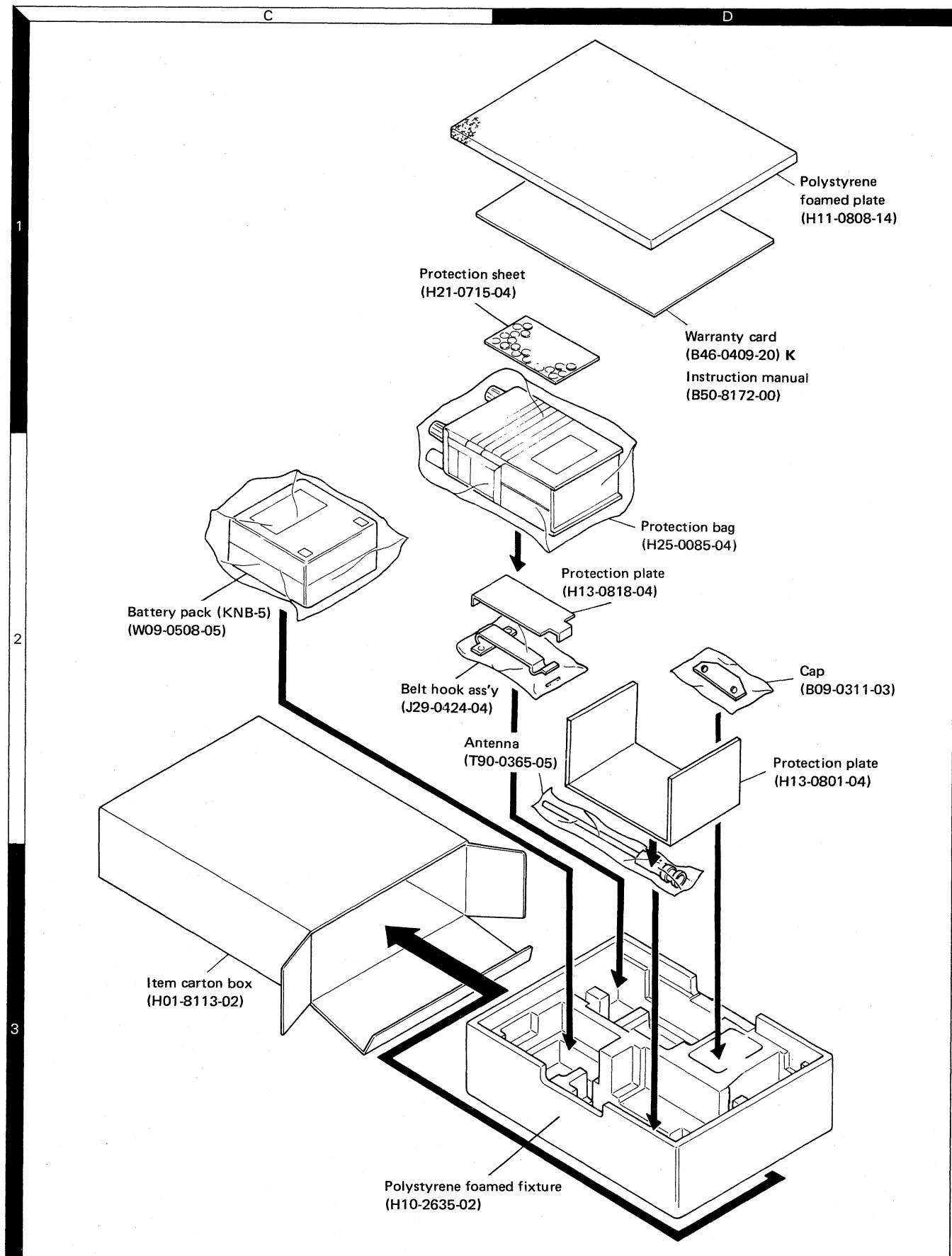
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DISASSEMBLY



PACKING



ADJUSTMENT

REQUIRED TEST EQUIPMENT

1. Stabilized Power Supply

- 1) The supply voltage can be changed between 5V and 18V, and the current is 3A or more.
- 2) The standard voltage is 7.5V.

2. DC Ammeter

- 1) Class 1 ammeter (17 ranges and other features)
- 2) The full scale can be set to either 300mA or 3A.
- 3) A cable of less internal loss must be used.

3. Frequency Counter (f. counter)

- 1) Frequencies of up to 1GHz or so can be measured.
- 2) The sensitivity can be changed to 250MHz or below, and measurements are highly stable and accurate (0.2 ppm or so).

4. Power Meter

- 1) Measurable frequency : Up to 500MHz
- 2) Impedance : 50Ω , unbalanced
- 3) Measuring range : Full scal of 10W or so
- 4) A standard cable (5D2W 1m) must be used.

5. RF VTVM (RF V.M)

- 1) Measurable frequency : Up to 500MHz or so

6. Linear Detector

- 1) Measurable frequency : Up to 500MHz
- 2) Characteristics are flat, and CN is 60dB or more.

7. Digital Voltmeter

- 1) Voltage range : FS = 18V or so
- 2) Input resistance : $1M\Omega$ or more

8. Oscilloscope

- 1) Measuring range : DC to 30MHz
- 2) Provides highly accurate measurments for 5 to 25 MHz.

9. AF Voltmeter (AF VTVM)

- 1) Measurable frequency : 50Hz to 1MHz
- 2) Maximum sensitivity : 1mV or more

10. Spectrum Analyzer

- 1) Measuring range : DC to 1GHz or more

11. Standard Signal Generator (SSG)

- 1) Maximum frequency : 500MHz or more
- 2) Output : $-127\text{dBm}/0.1\mu\text{V}$ to $13\text{dBm}/1\text{V}$
- 3) Output impedance : 50Ω

12. Tracking Generator

- 1) Center frequency : 50kHz to 500MHz
- 2) Frequency deviation : $\pm 35\text{MHz}$
- 3) Output voltage : 100mV or more

13. Dummy Load

- 1) 8Ω , 3W or more

14. Distortion Meter

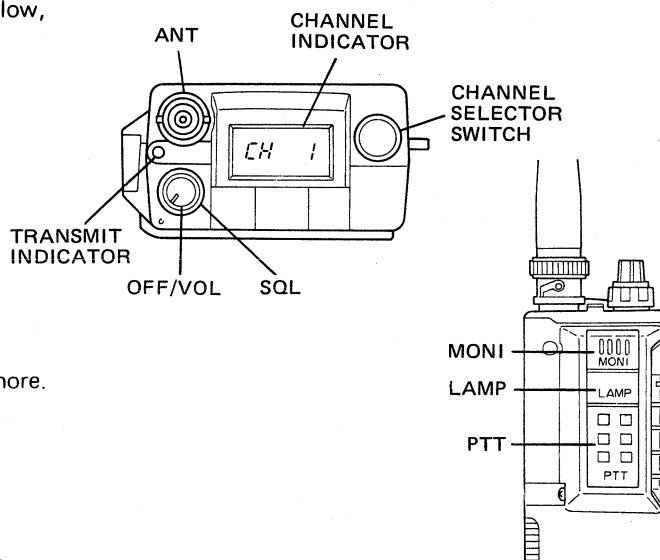
- 1) Capability : 3% or less at 1kHz
- 2) Input level : 50mV to 10Vrms

PREPARATION

- Set the unit in the receiving mode and set the controls as follows, unless otherwise specified.

POWER/VOL ON
SQL VR MIN

- Use a non-conductive rod such as a Bakelite rod for adjustment (especially of trimmers and coils).
- To protect the SSG, do not send out signals while adjusting the receiving unit.



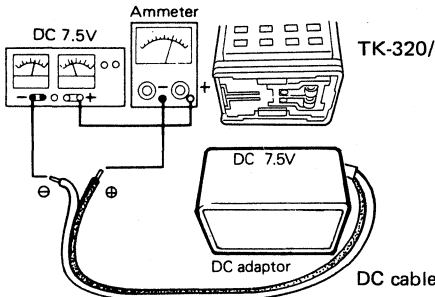
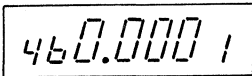
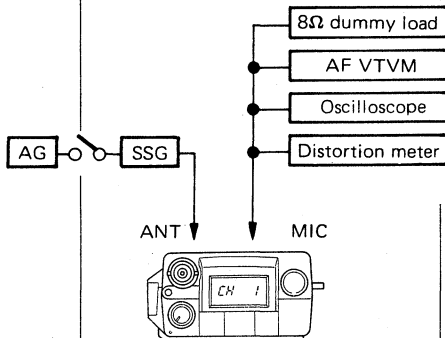
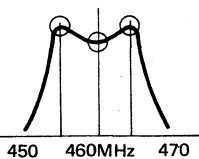
- The frequencies shown in the table have been written when the set leaves the factory. The set has been adjusted with reference to CH1, CH2 and CH3.
- When other frequencies are requested, please write them following the instructions in the adjustment procedure.

CH	TX freq' (MHz)	RX freq' (MHz)	Tone freq' (TX, RX) (Hz)
1 (M)	460.000	460.100	—
2 (L)	450.000	450.100	—
3 (H)	469.9875	469.900	—
4	455.500	455.500	131.8
5	455.500	455.500	151.4
6	457.000	457.100	225.7
7	455.000	455.100	—
8	465.000	465.100	—
9	465.500	465.500	186.2
10	465.500	465.500	210.7
11	457.500	457.500	100

L : Low freq' M : Mid freq' H : High freq'

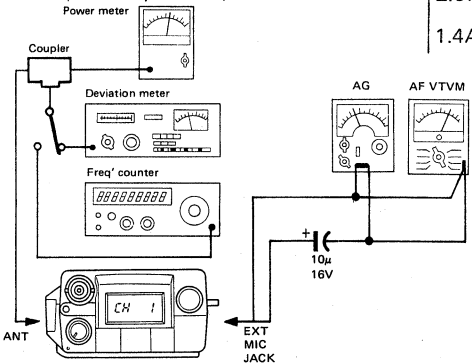
ADJUSTMENT

Alignment

Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
1. Setting	1) Connect DC 7.5V to the battery terminal. Note 1. Measure voltage at battery terminal. 2. Adjust voltage of power supply to be 7.5V in transmitting.							
2. Reset	1) POWER SW : OFF 2) Hold down MONI SW POWER SW : ON						Unit reset.	Channel indicator 
3. Write the requested frequencies in the TK-320.								
4. PLL lock voltage check	1) Both transmission and reception with the channel used.	DVM	PLL	TP1			Check	1.0 ~ 4.0V
	2) When the lock voltage is out of rating. CH : Channel with TX highest freq' (fTH). PTT : ON				PLL	TC1	3.7V	±0.3V
5. TCXO (Transmit) frequency adjustment	1) CH : Channel with TX center freq' (fTM). PTT : ON Note 1. Perform this more than 1 minute after turning POWER ON. 2. TCXO is adjusted precisely at 25°C. If it is readjusted, the frequency stability is changed. Do not touch it normally.	Freq' counter		ANT	PLL	TC51	Freq' adj. of TX.	±100Hz
6. BPF	1) CH : Channel with RX center freq' (fRM). SSG : Channel freq' Output : Reduce from 500μV/-53dBm until 0.32μV/-117dBm.	Oscilloscope AF V.M SSG Distortion meter		EXT.SP	TX-RX	L6, 8	SINAD MAX.	12dB SINAD or more.
	2) Output : 1μV/-107dBm							
	3) With spectrum analyzer T.G. : -40dBm	T.G.		ANT	TX-RX	L9	SINAD MAX. MAX GAIN.	
		Spectrum analyzer	TX-RX	TP2				

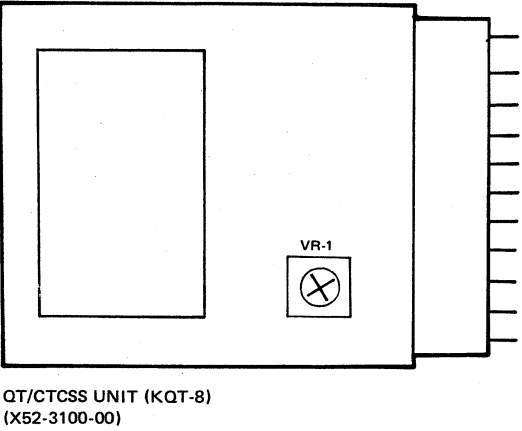
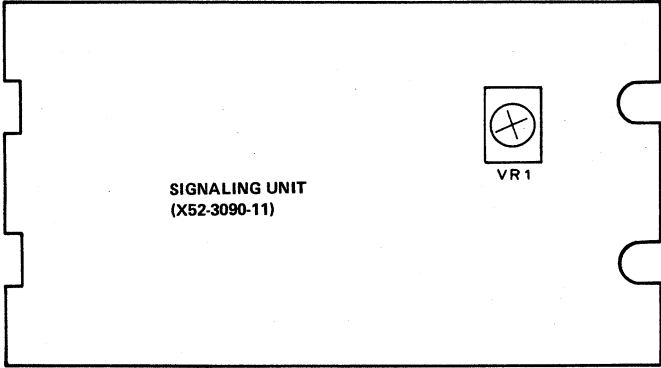
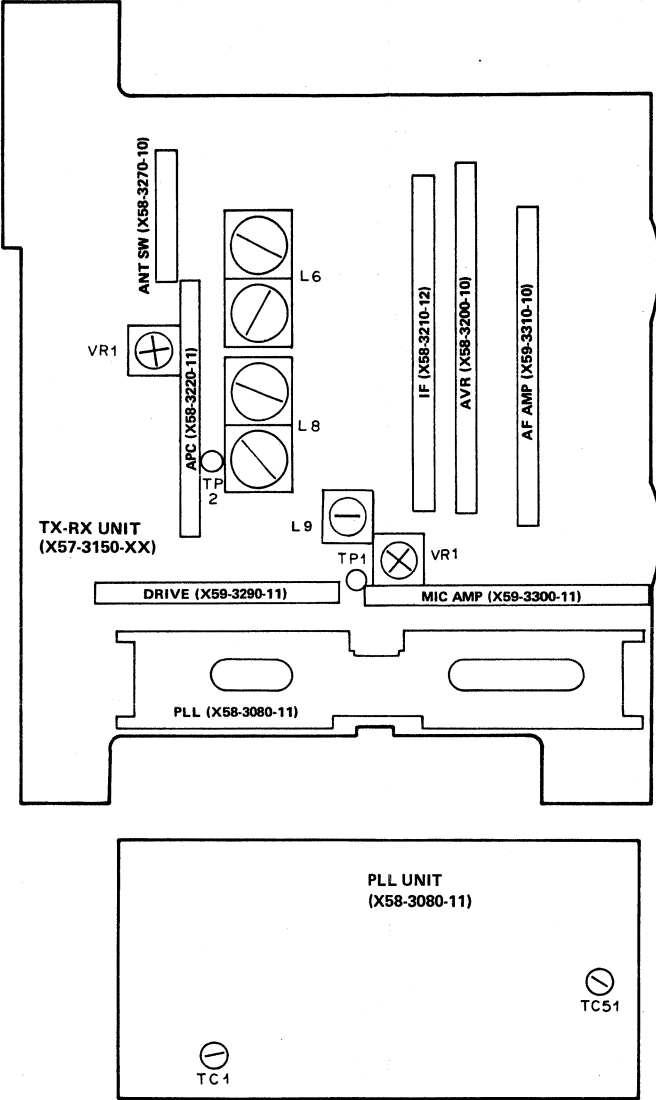
ADJUSTMENT

Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
7. Sensitivity	1) CH : Channel with highest RX freq' (fRH) and lowest RX freq' (fRL). SSG freq' : CH (fRH) or (fRL). output : 0.32μV/ -117dBm MOD : 1kHz, DEV : 3kHz	Oscillo-scope AF V.M SSG Distortion meter		EXT. SP			Check	12dB SINAD or more.
8. Squelch	1) CH : Channel used. SSG : OFF MONI SW : ON SQL : Adjust to the position with which the noise is eliminated.	Oscillo-scope AF V.M SSG		EXT. SP			Check	SQL knob. Within 9 : 30 ~ 11 : 30
	2) SSG : 0.2μV/-121dBm							Squelch open.
	3) SQL : MAX SSG : 0.7μV/-110dBm						Check	Squelch open. Busy lights.
9. Power (APC) adjustment	1) CH : Channel with highest TX freq' (fTH). PTT : ON Power supply : 12.0V	TX LED Power meter DC ammeter	Panel	TX LED	ANT	APC	VR1	Check 3.0W adj. ±0.1W
	2) Power supply : DC 7.5V CH : Channel with lowset TX freq' (fTL), center TX freq' (fTM) and highest TX freq' (fTH). PTT : ON							Check 2.0W +1W -0.5W 1.4A or less.
10. Tone deviation adjustment KQT-8 (Option)	1) CH : Set the channel selector to the channel with QT /CTCSS is used. Deviation meter filter LPF : 3kHz, HPF : OFF De-emphasis : OFF PTT : ON	Power meter Deviation meter	Rear panel	ANT	KQT-8	VR1	±0.75kHz adj.	±200Hz
11. Maximum deviation adjustment	1) Connect AG to the MIC terminal. AG : 1kHz/150mV Deviation meter filter LPF : 20kHz, HPF : OFF De-emphasis : OFF CH : Channel with highest TX freq' (fTH).	Power meter AG Deviation meter AF V.M	Panel	ANT	MIC AMP	VR1	±4.4kHz adj. (±4.9kHz adj. when signaling unit installed.) Adjust one more than the other by switching between -p and +p.	±100Hz
12. MIC sensitivity	1) AG : 15mV PTT : ON						Check	±2.3 ~ 3.7kHz
13. DTMF adjustment TK-320(DM) only.	1) CH : 460.000MHz PTT : ON Keyboard : [3], [6] push.	Power meter Deviation meter	Panel	ANT	Signal-ing	VR1	±2.8kHz adj.	±100Hz
	2) PTT : ON Keyboard : [2], [3] push.	AF V.M Freq' counter					Check	Freq' : 1477Hz +10Hz -15Hz DEV : ±0.7kHz ~ ±1.7kHz.



ADJUSTMENT

Adjusting point

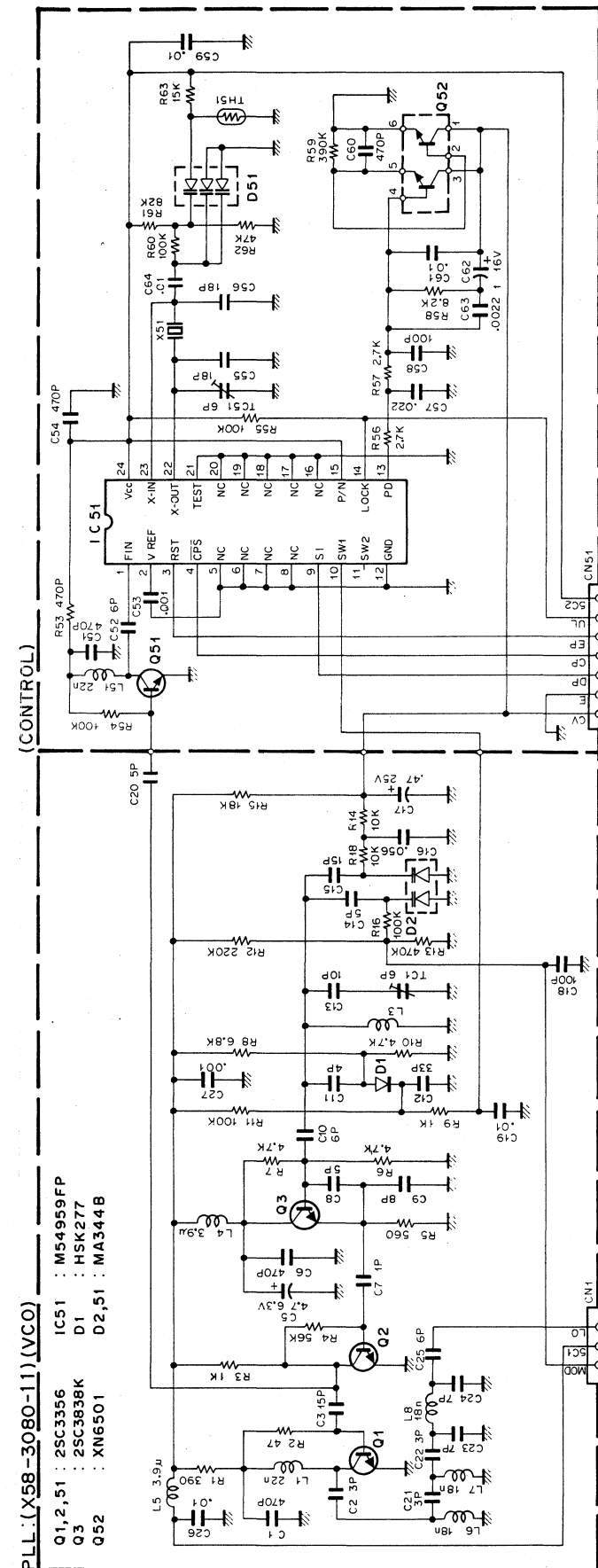


TERMINAL FUNCTIONS

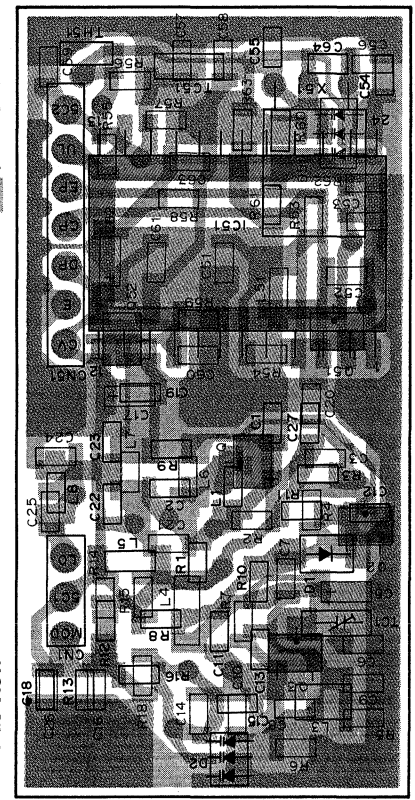
Connector No.	Terminal No.	Terminal Name	Function
TX-RX UNIT (A/3) — CONTROL UNIT			
CN1	1	E	Ground.
	2	B	Not used.
	3	SS	PTT SW signal. "L" : TX, "H" : RX.
	4	SDO	Tone signal match/mismatch identification signal.
	5	ET	Tone enable.
	6	EP	PLL enable.
	7	CP	Clock signal.
	8	DP	PLL, tone serial data.
	9	UL	PLL unlock signal.
	10	TO1	Not used.
	11	MU2	Mute signal. "H" : Mute.
	12	MU1	Mute signal. "H" : Mute.
	13	BP	Beep signal.
	14	5M	5V power supply for MPU and MIC.
	15	SV	SAVE signal output. "L" : Save, "H" : Normal.
	16	BC	Battery voltage check signal.
	17	TX	Transmit/receive switching signal. "L" : TX, "H" : RX.
	18	SM	S-meter signal.
	19	SC	Busy signal.
	20	NC	
TX-RX UNIT (A/3) — CTCSS UNIT (KQT-8)			
	1	ET	Tone enable.
	2	DP	Tone serial data.
	3	CP	Clock signal.
	4	TO	Tone output.
	5	PTT	Not used.
	6	SDO	Tone signal match/mismatch identification signal.
	7	CO	Not used.
	8	5C	5V power supply.
	9	CI	Audio signal input.
	10	E	Ground.
TX-RX UNIT (A/3) — TX-RX UNIT (C/3)			
CN2	1	5T	5V power supply for transmit.
	2	DTMF	DTMF signal. TK-320(DM)
	3	MIC	Signal line from microphone.
	4	SP	Signal line to built in speaker.
	5	E	Ground.
	6	5M	5V power supply for MPU and MIC.
	7	PTT	External standby line.
TX-RX UNIT (A/3) — TX-RX UNIT (B/3)			
W2	1	A2	AF volume input line.
	2	E	Ground.
	3	A1	AF amplifier input line.
	4	SQ	Squelch volume input line.
	5	SB	B power supply after power switch.
TX-RX UNIT (C/3)			
W3	1	KM	Mic mute signal. TK-320(DM)
	2	E	Ground.
	3	SP	Audio output.
	4	5T	5V power supply for transmit.
	5	DTMF	DTMF signal. TK-320(DM)

TK-320/320(DM) CIRCUIT DIAGRAM / PC BOARD VIEWS

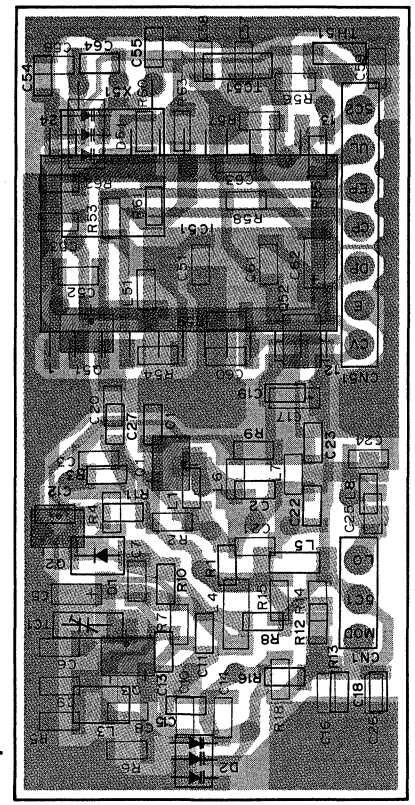
PLL : Z8 (X58-3080-11)



Component side
Foil side



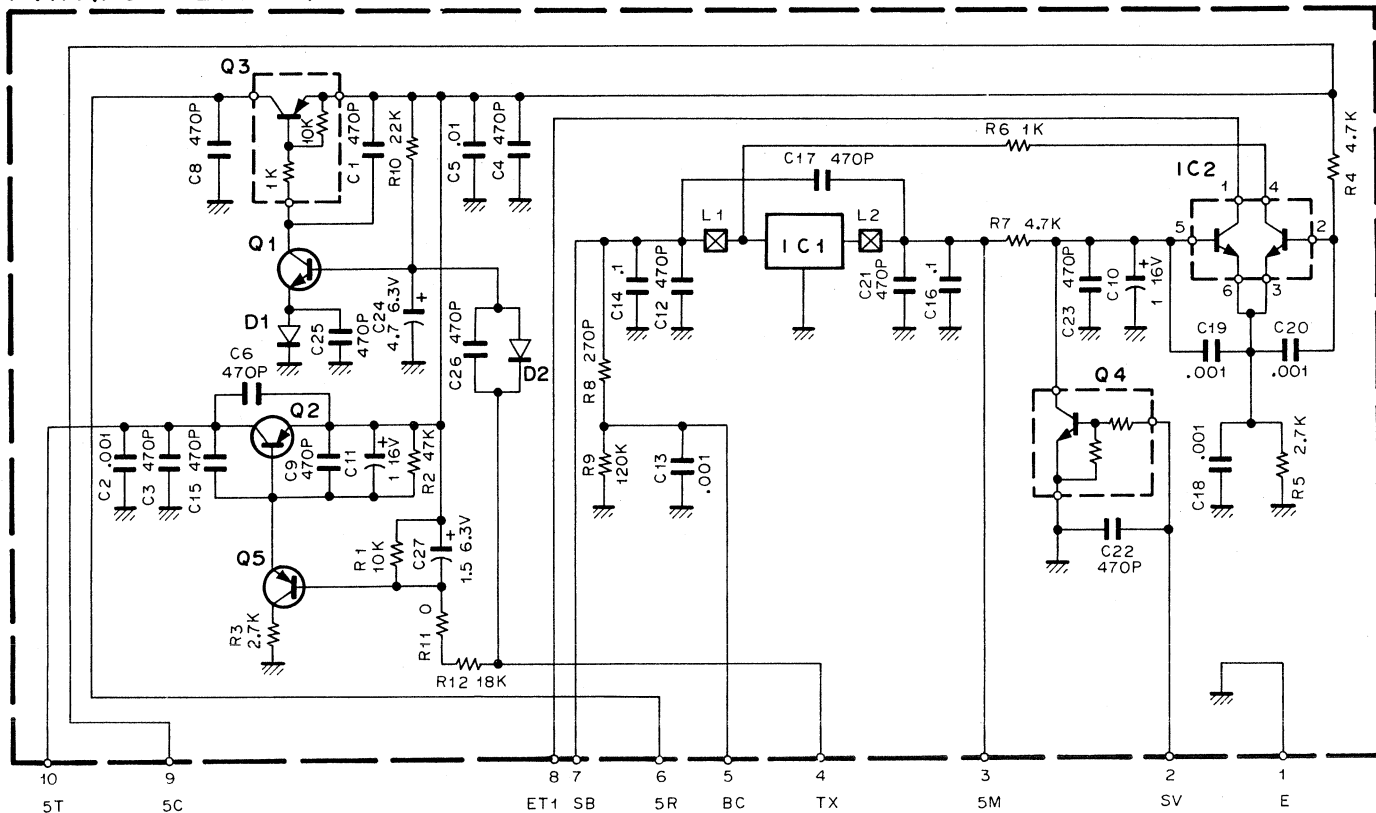
Component side view



CIRCUIT DIAGRAM / PC BOARD VIEWS TK-320/320(DM)

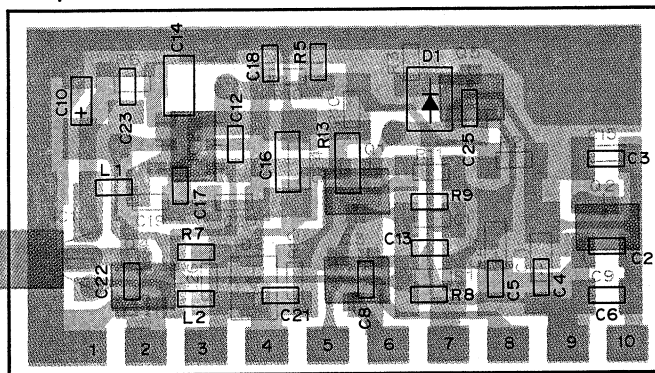
AVR : Z7 (X58-3200-10)

AVR : (X58-3200-10)

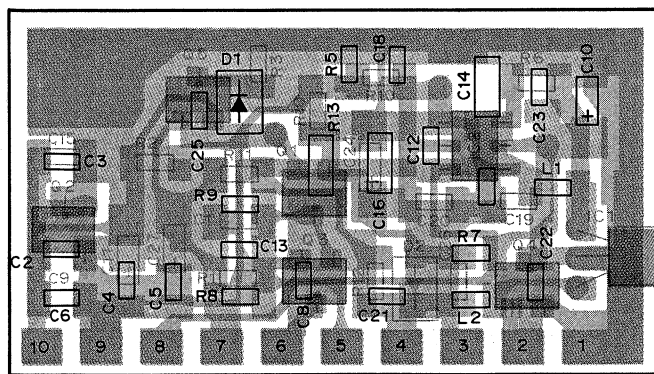


Q1 : 2SD1819 IC1 : LP2950CZ D1,2 : MA110
 Q2 : 2SA1313(Y) IC2 : IMX1
 Q3 : DTA113ZU or UN5119
 Q4 : DTC144EU
 Q5 : 2SB1218

Component side view



Foil side view

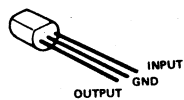


2SA1313(Y)
 2SB1218
 2SC3356
 2SC3838K
 2SD1819

DTC144EU
 UN5119



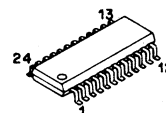
LP2950CZ



IMX1
 XN6501



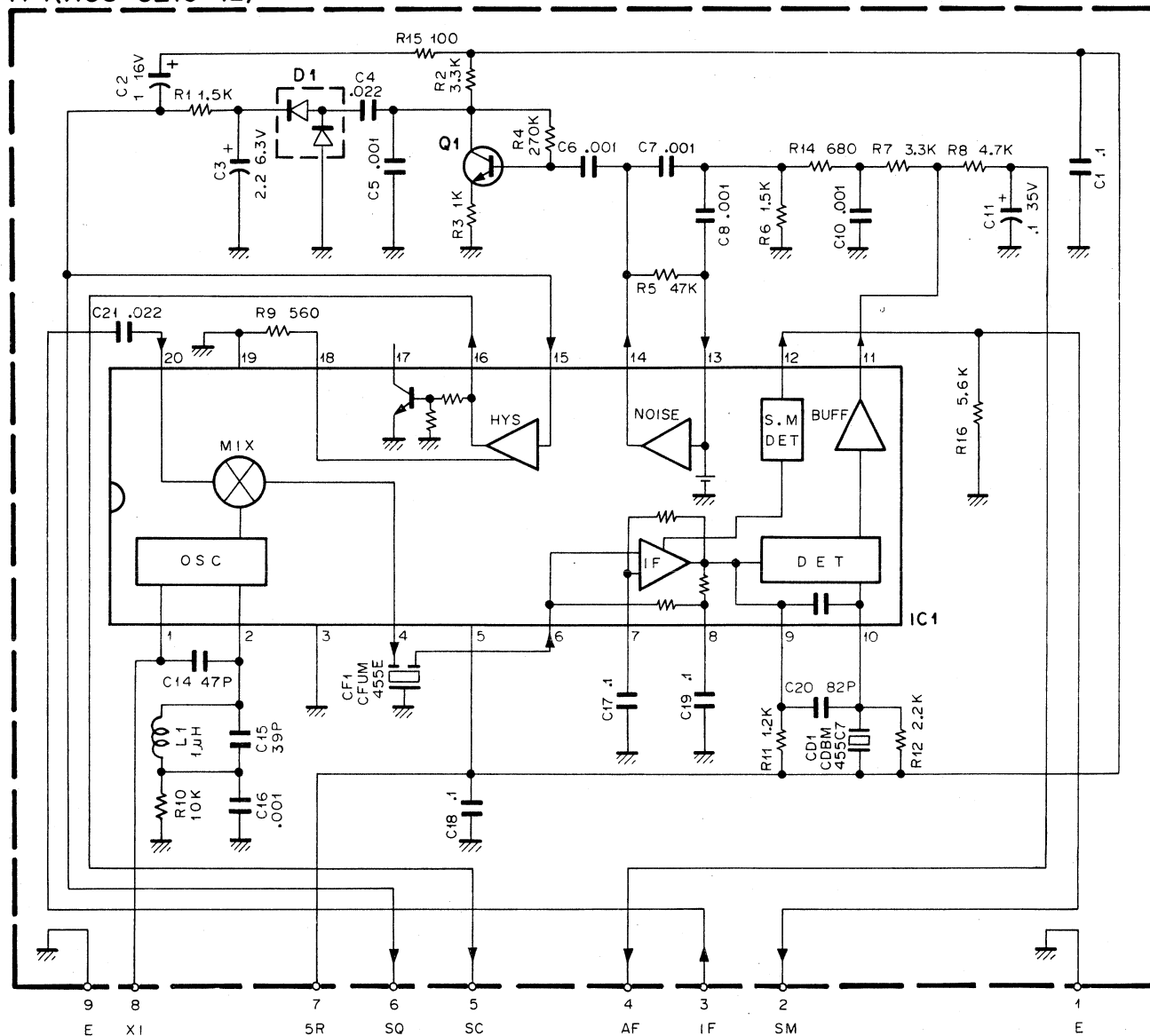
M54959FP



TK-320/320(DM) CIRCUIT DIAGRAM / PC BOARD VIEWS

IF : Z2 (X58-3210-12)

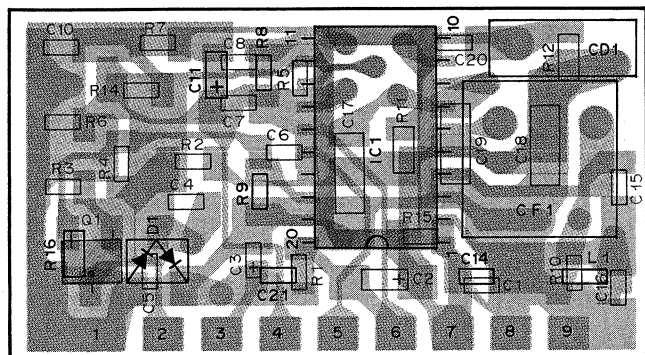
IF : (X58-3210-12)



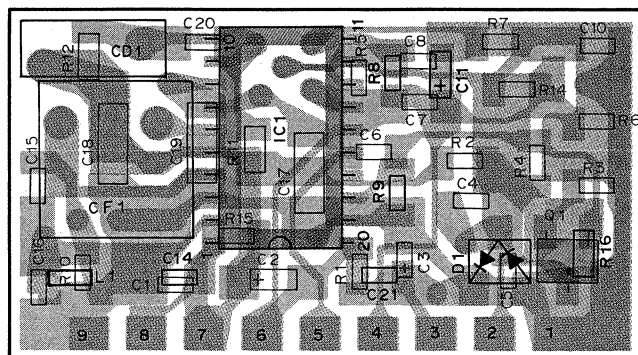
Q1 : 2SC2712 (GR)
IC1 : TK10485MT (B,C)

D1 : HSM88AS

Component side view



Foil side view

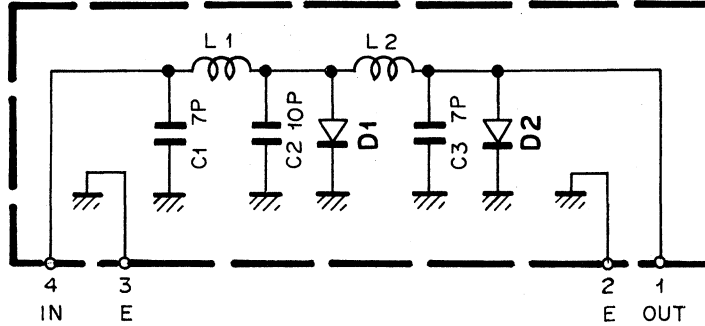


■ : Component side
■ : Foil side

TK-320/320(DM) CIRCUIT DIAGRAM / PC BOARD VIEWS

ANT SW : Z1 (X58-3270-10)

ANT SW : (X58-3270-10)

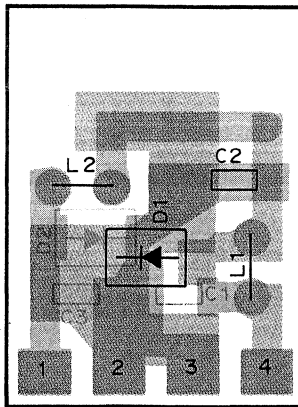


D1,2 : HSK277

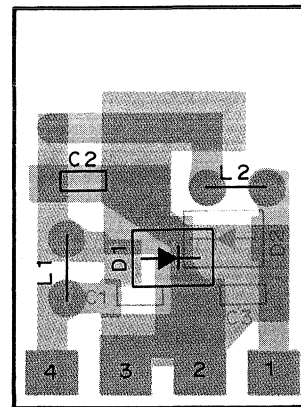
■ : Component side

■ : Foil side

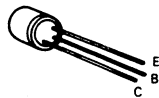
Component side view



Foil side view



2SC4093



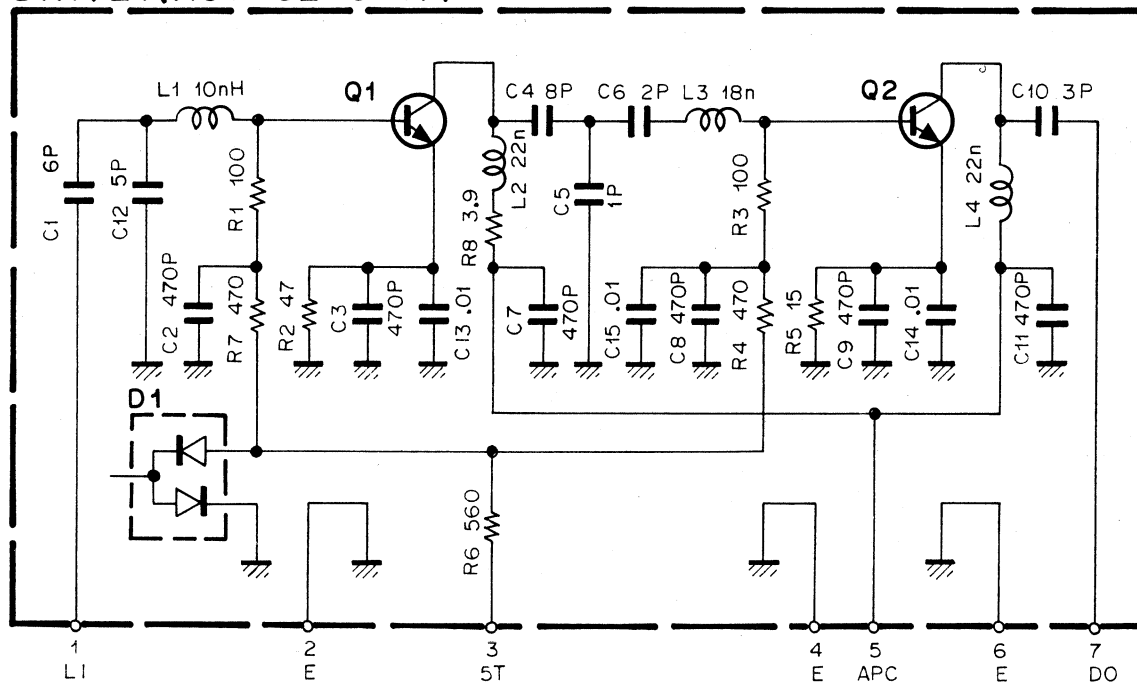
2SC2954



CIRCUIT DIAGRAM / PC BOARD VIEWS TK-320/320(DM)

DRIVE : Z5 (X59-3290-11)

DRIVE : (X59-3290-11)

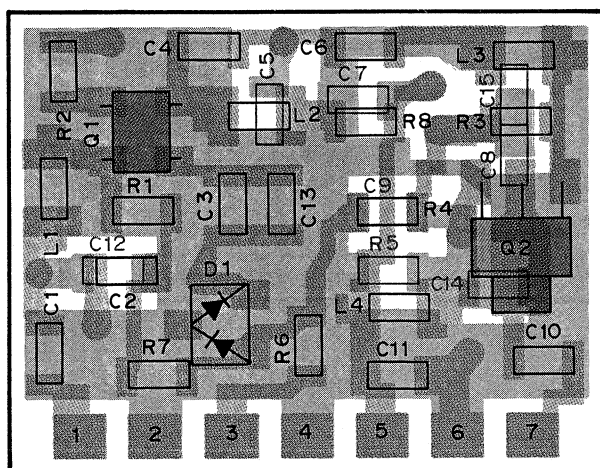


Q1 : 2SC4093

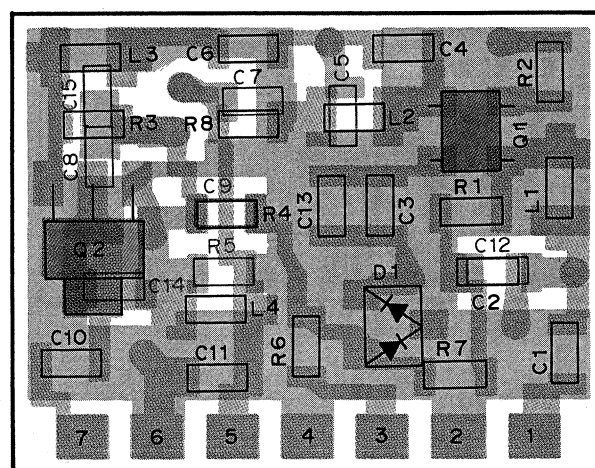
Q2 : 2SC2954

D1 : 1SS226

Component side view



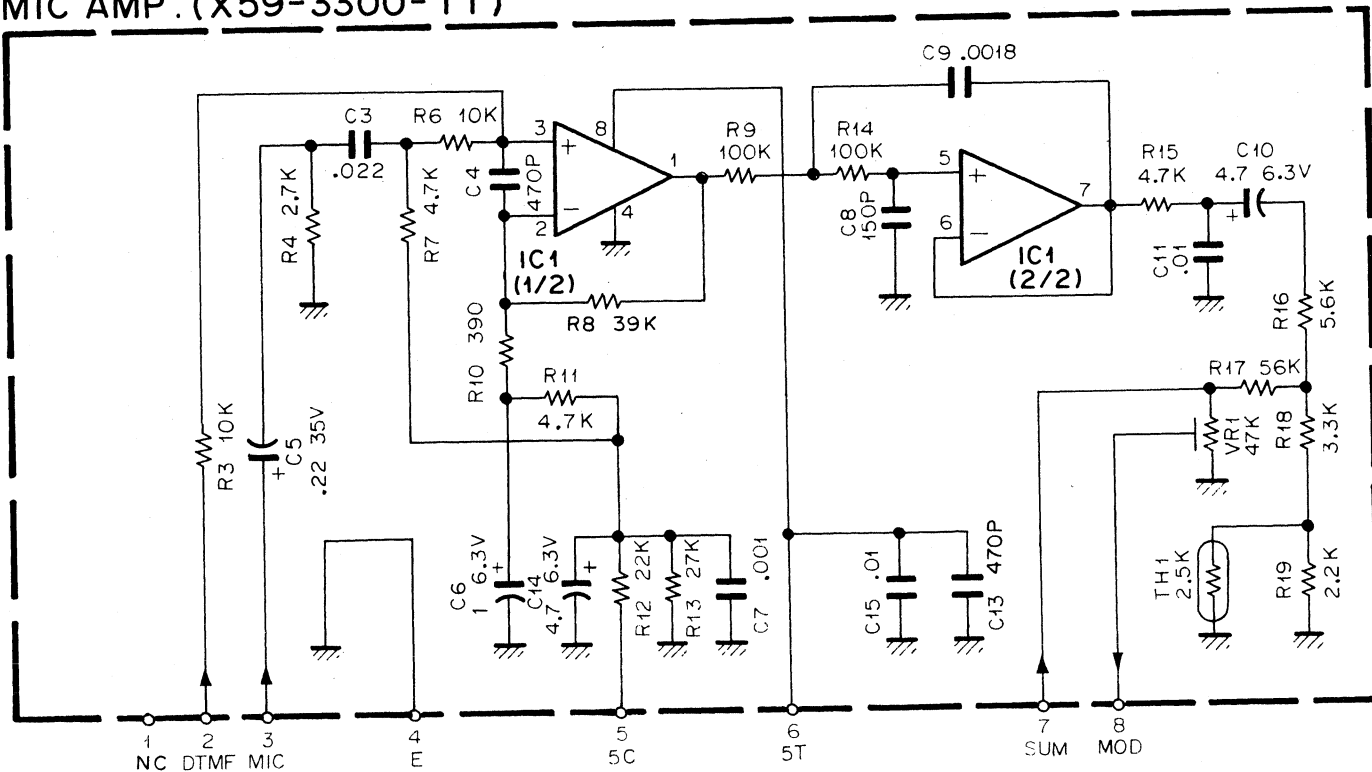
Foil side view



TK-320/320(DM) CIRCUIT DIAGRAM / PC BOARD VIEWS

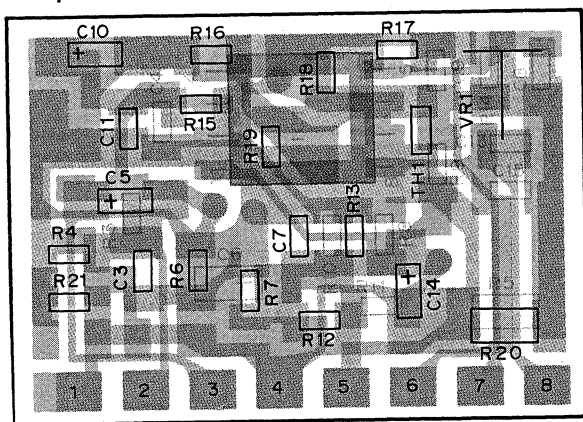
MIC AMP : Z4 (X59-3300-11)

MIC AMP : (X59-3300-11)

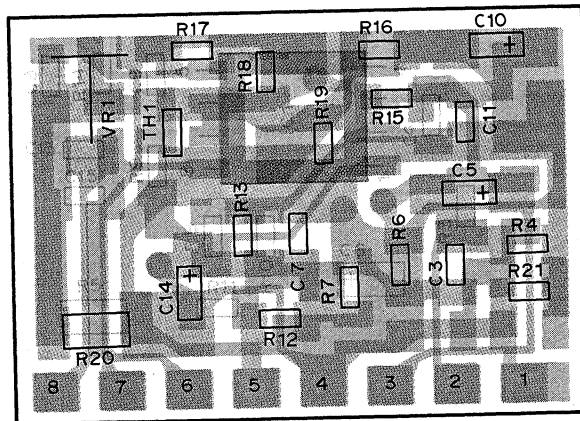


IC1 : NJM4560

Component side view



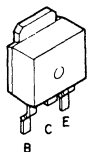
Foil side view



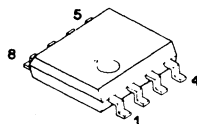
2SC2712(GR)
DTC144EK



2SB1182(F5)Q



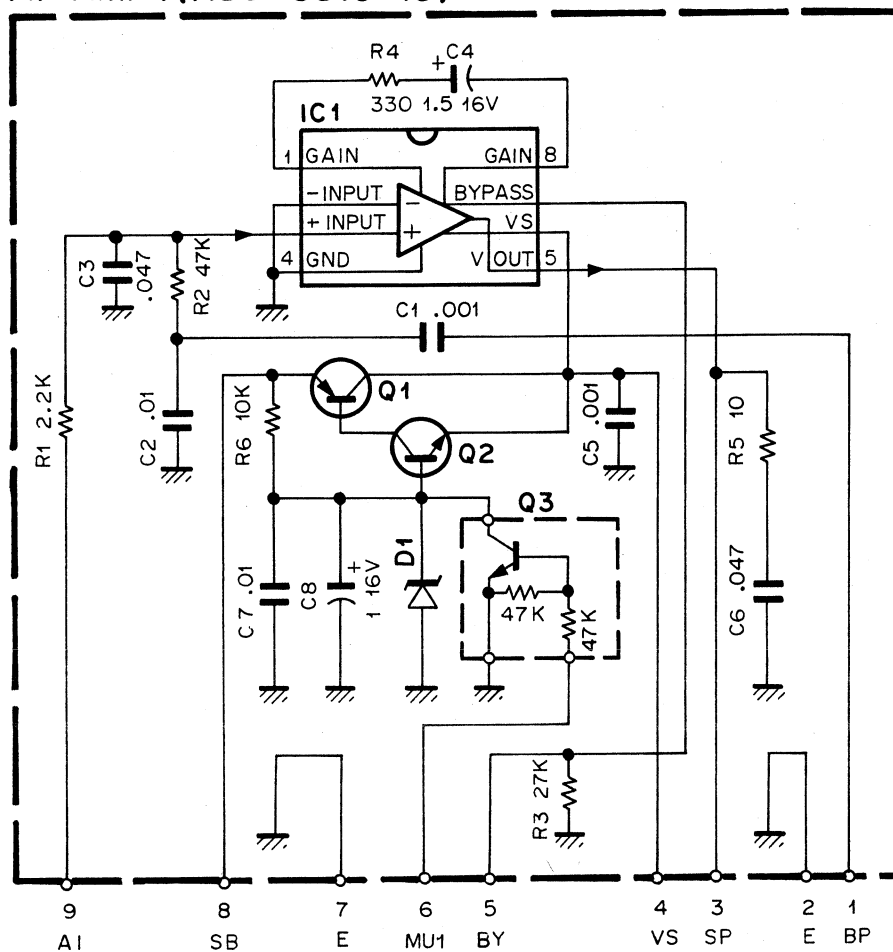
NJM386BM
NJM4560



CIRCUIT DIAGRAM / PC BOARD VIEWS TK-320/320(DM)

AF AMP : Z3 (X59-3310-10)

AF AMP : (X59-3310-10)



Q1 : 2SB1182 (F5)Q

IC1 : NJM386BM

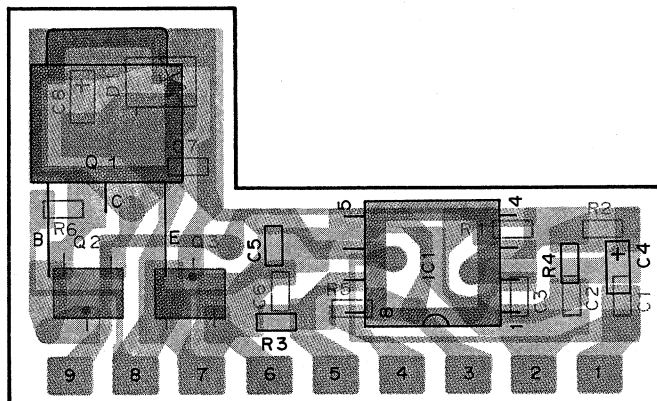
Q2 : 2SC2712 (GR)

D1 : 02CZ6.8X or

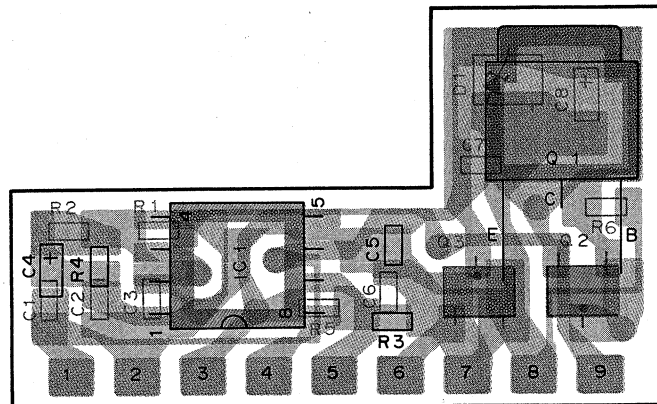
Q3 : DTC144EK

RD6.8M-B1

Component side view



Foil side view

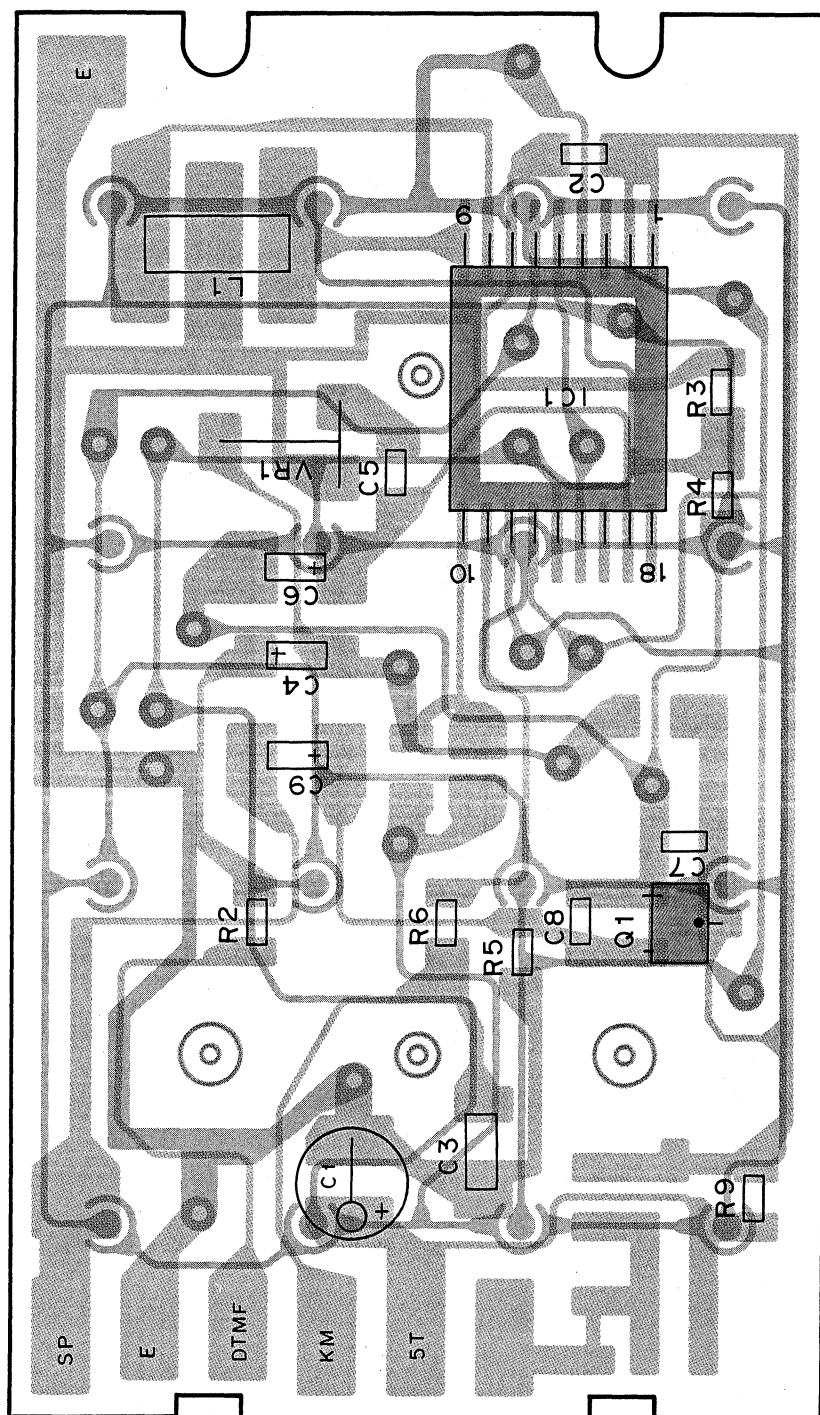


■ : Component side

■ : Foil side

TK-320/320(DM) PC BOARD VIEW

SIGNALING UNIT (X52-3090-11) : TK-320 (DM) Component side view



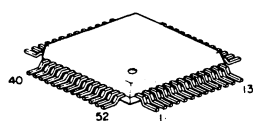
Q1 : 2SC2712(GR) IC1 : LR40872

□ : Component side
■ : Foil side

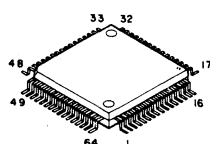
2SA1162(Y)
2SC2712(GR)
2SC2712(Y)



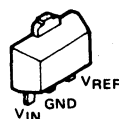
LH5008TP



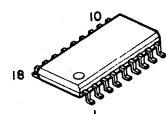
μPD75108AG



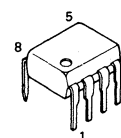
S8054ALR



LR40872



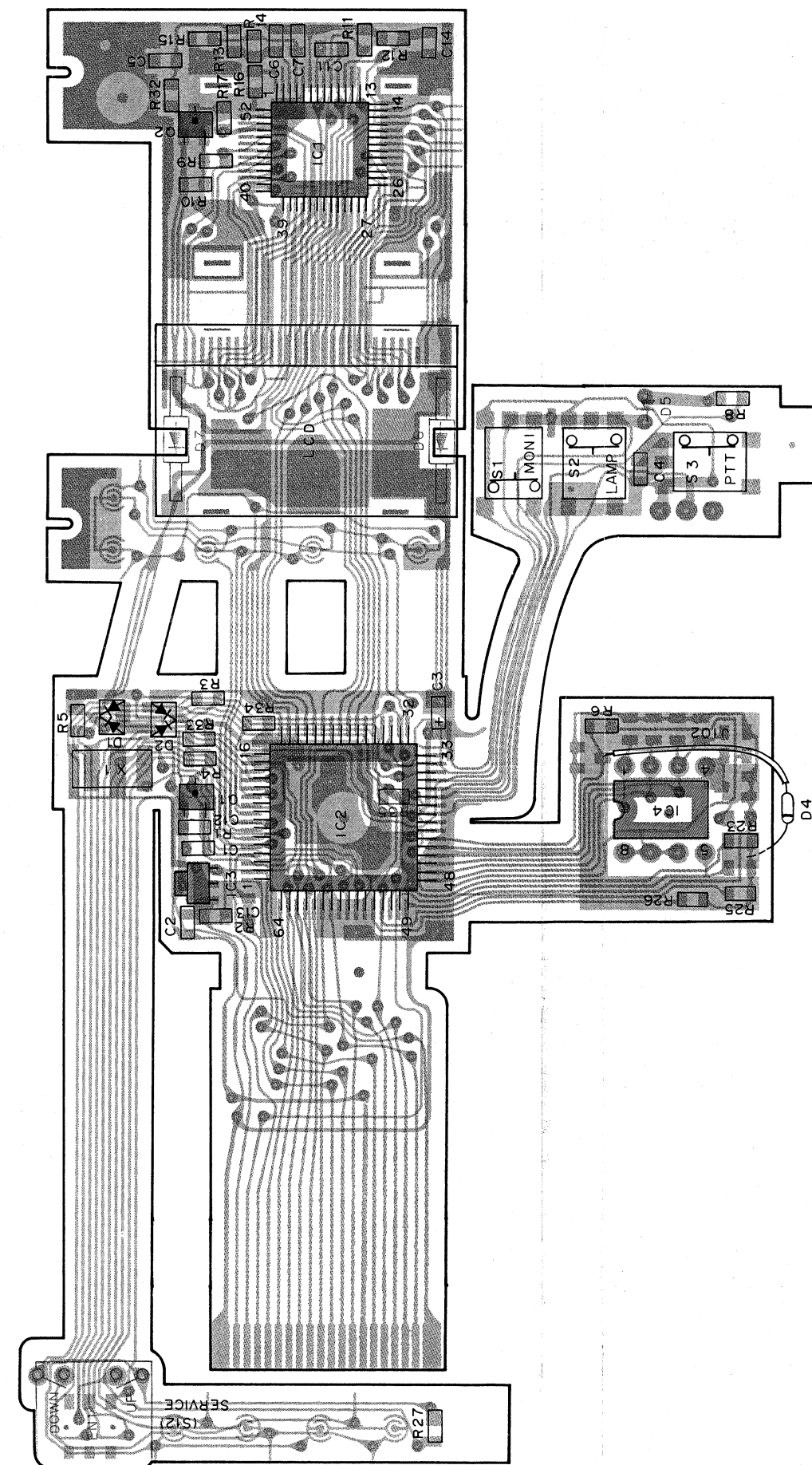
93C46PI



CONTROL UNIT (X53-3170-10) Foil side view

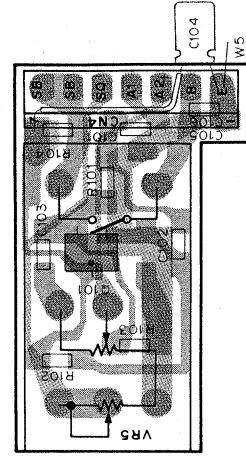
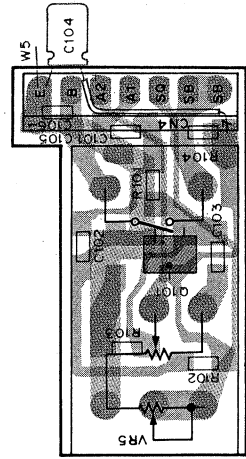
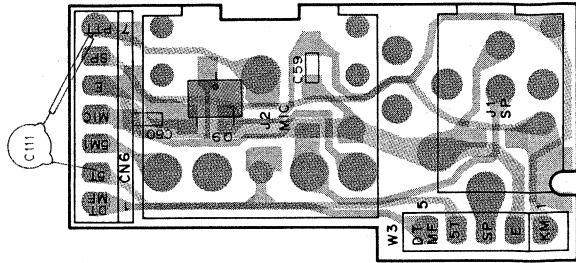


Q1 : 2SC2712(Y) Q2 : 2SA1162(Y)
IC1 : LH5008TP IC2 : μ PD75108AG IC3 : S8054ALR IC4 : 93C46PI
D1,2 : 1SS184 D4 : 1SS133 D5 : SLH34VC3 D6,7 : LN01301C(Q)

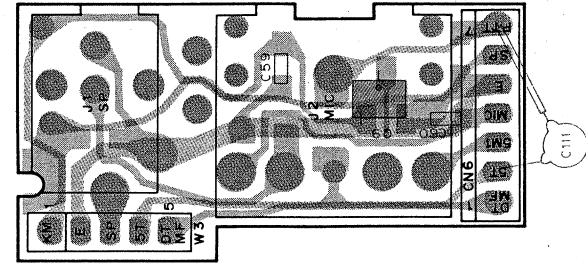


TK-320/320(DM) PC BOARD VIEWS

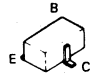
TX-RX UNIT (X57-3150-XX) -12 : TK-320(DM) -13 : TK-320
Component side view



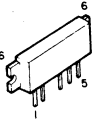
TX-RX UNIT (X57-3150-XX) -12 : TK-320(DM) -13 : TK-320
Foil side view



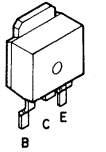
2SC2714(Y)
2SC3356
2SC4116(GR)
DTC143TK
DTC143TU



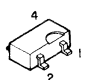
M57797H



2SB1182(Q)



2SC4093



Q1,2 : 2SC4093 Q3 : 2SC3356 Q4 : 2SC2714(Y) Q5 : DTC143TU Q7,8 : 2SB1182(Q)

Q9 : DTC143TK Q101 : 2SC4116(GR)

IC1 : M57797H

D1 : M1308 D2 : HSM2693 D4 : HSM88AS D5 : MA856

□ : Component side
■ : Foil side

Signal line

Control line

Common DC line

SCHEMATIC DIAGRAM TK-320/320(DM)

IC 1 LH5008TP
IC 2 UPD75108AG
IC 3 S8054ALR
IC 4 93C46PI
Q 1 2SC2712(Y)
Q 2 2SA1162(Y)

D1,2 ISS184
D4 ISS133
D5 SLH34VC3
D6,7 LNO130IC(Q)

IC 1 M57797H

Q1,2 2SC4093
Q3 2SC3356
Q4 2SC2714(Y)
Q5 DTC143TU
Q7,8 2SB1182(Q)
Q9 DTC143TK
Q101 2SC4116(GR)

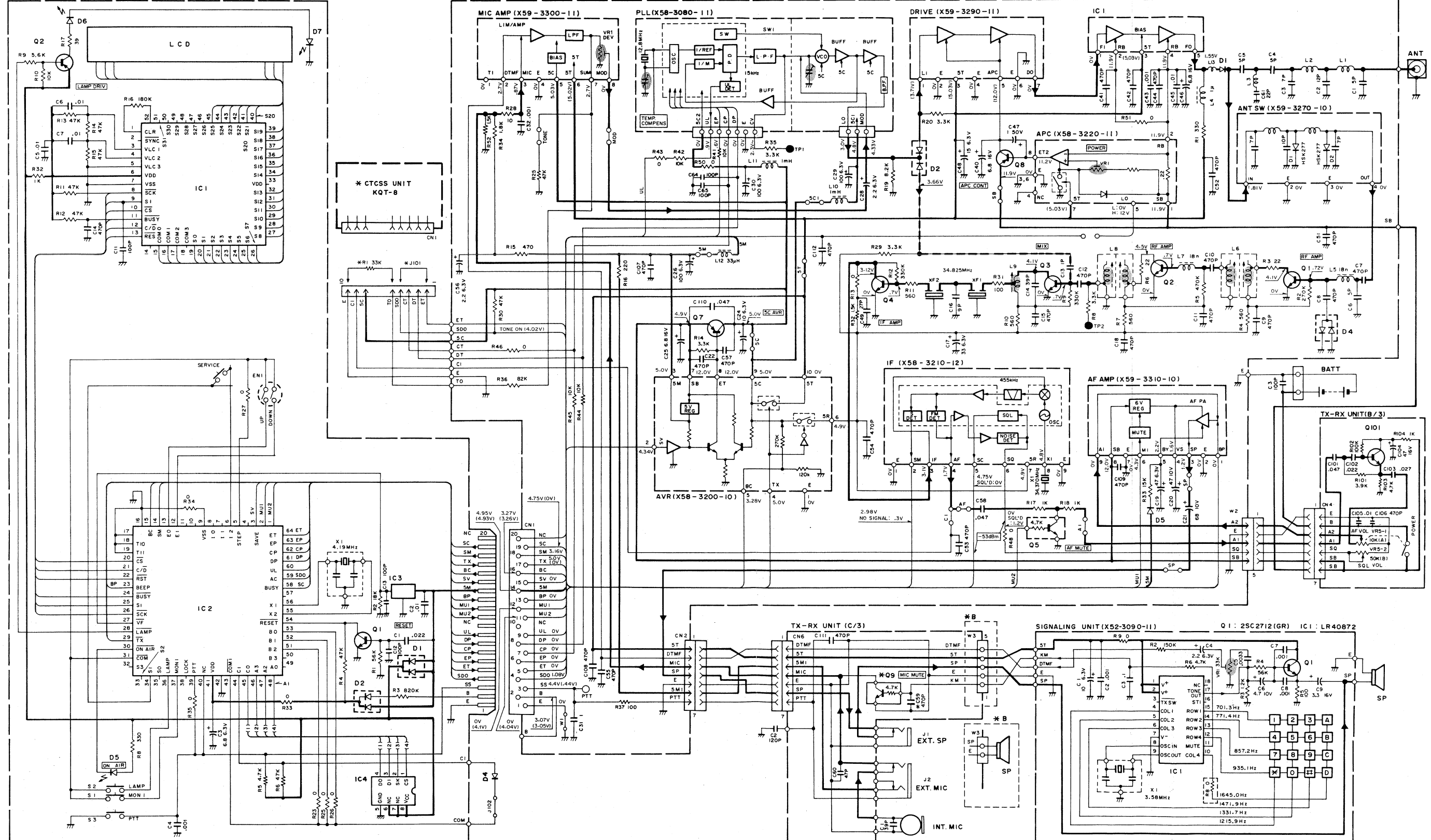
D1 M1308
D2 HSM2693
D5 MA856
D4 HSM88AS

	GENERAL				TX-RX UNIT		
	R1	J101	KQT-8	SIGNALING UNIT	OP	CB9	W3
TK-320	K	X	X	O	X	X	B
TK-320 (DM)	M	O	O	OPTION			
	K	X	X	O			
	M	O	O	OPTION			

O: Used, X: Not used.

CONTROL UNIT (X53-3170-10)

TX-RX UNIT (X57-3150-XX) (A/3)



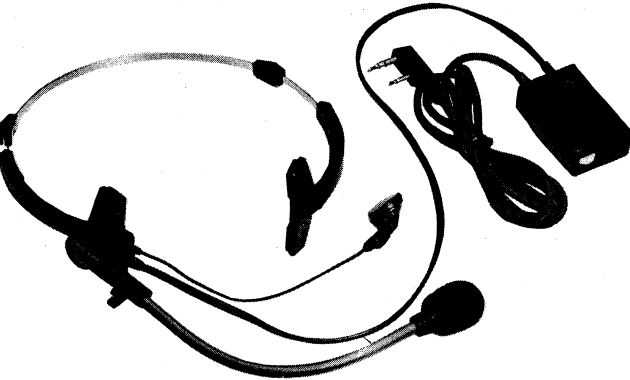
TK-320/320(DM)

TK-320/320(DM)

KHS-1 (HEAD SET WITH VOX & PTT)

KHS-1 (HEAD SET WITH VOX & PTT)

KHS-1 EXTERNAL VIEW

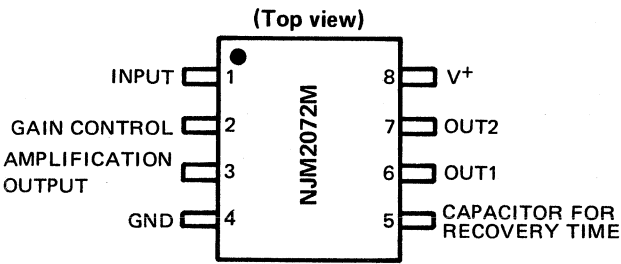


KHS-1 SPECIFICATIONS \

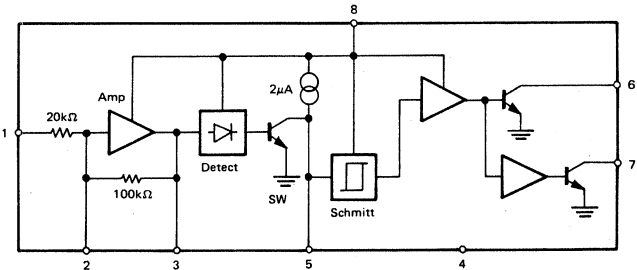
- Electrical characteristic
- Earphone
Diameter ϕ19
Impedance 19Ω (1000Hz)
Max. input power 50mW
 - Microphone
Output sensitivity ... -70dB (0dB = 1V/μbar 1000Hz)
Output impedance 1.6kΩ (1000Hz)

KHS-1 SEMICONDUCTOR DATA

- Terminal connection diagram

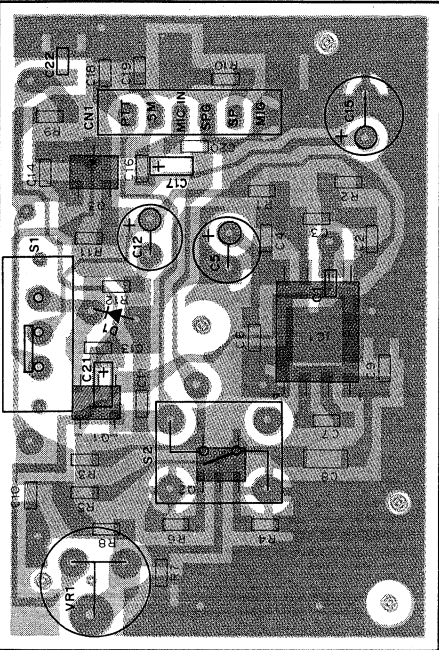


- Block diagram

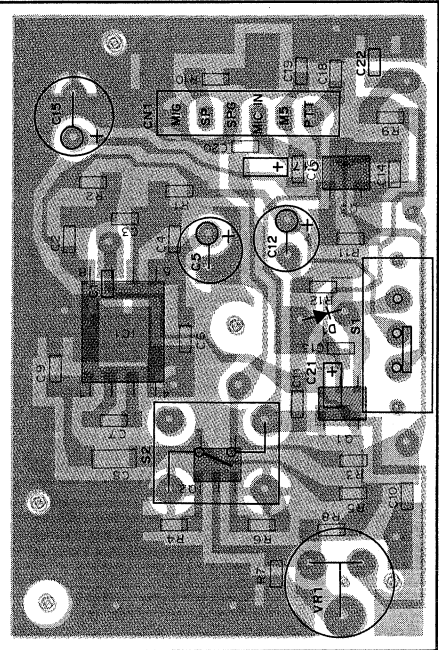


KHS-1 PC BOARD VIEWS

Component side view



Foil side view

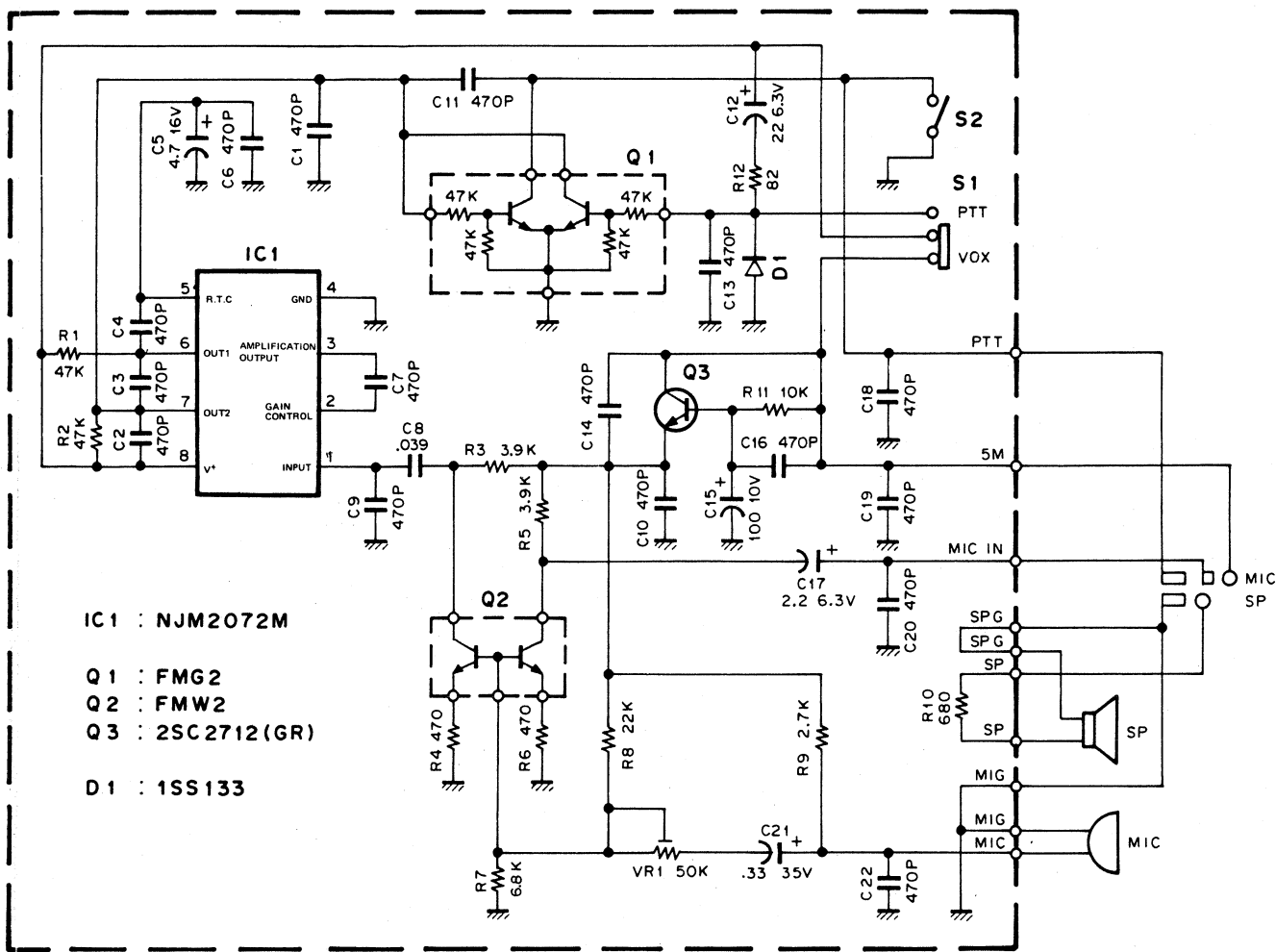


Component side
Foil side

KHS-1 PARTS LIST

Ref. No.	New Parts	Parts No.	Description
	*	A02-0840-08	Case (Front)
	*	A02-0841-08	Case (Rear)
	*	E30-2088-08	Cable with plug
	*	F09-0418-08	Microphone pad
	*	F09-0419-08	Ear pad
	*	J29-0427-08	Clip
	*	R05-4422-08	Potentiometer 50kΩ
VR1	*	S31-1416-08	Slide switch PTT/VOX
S1	*	S50-1413-05	Tact switch PTT
S2	*	T18-0056-08	Earphone with cable
	*	T91-0373-18	Microphone Ass'y
	*	W02-0806-18	VOX/PTT unit
Q1	*	FMG2	Digital transistor
Q2	*	FMW2	Digital transistor
Q3	*	2SC2712(GR)	Chip transistor
IC1	*	NJM2072M	IC
D1	*	1SS133	Diode

KHS-1 CIRCUIT DIAGRAM



KMC-8A (SPEAKER MICROPHONE) / KWR-1 (WATERPROOF CASE)

KMC-8A EXTERNAL VIEW



KMC-8A SPECIFICATIONS

Electrical characteristic

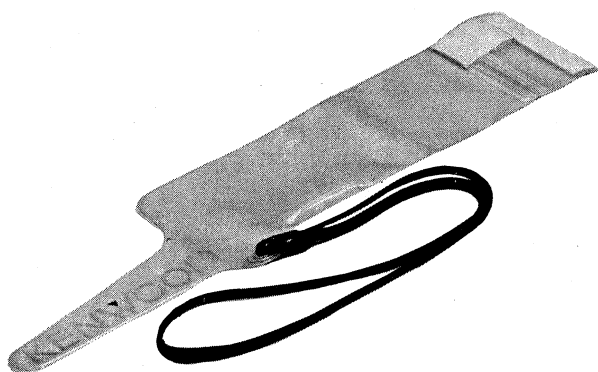
- **Speaker**
 - Diameter $\phi 50$ (mm)
 - Impedance 8Ω
 - Rated input power 0.5W
 - Max. input power 0.7W
- **Microphone**
 - Sensitivity $-67\text{dB} \pm 3\text{dB}$ at 1000Hz
 - Output impedance $1.6\Omega \pm 30\%$ at 1000Hz

KMC-8A PARTS LIST

* : New Parts

Ref. No.	New Parts	Parts No.	Description
	*	D10-0605-08	PTT lever
	*	E30-2110-05	Curl cord ass'y
		J19-1360-08	Clip
		T07-0219-08	Speaker
		T97-1024-08	Microphone

KWR-1 EXTERNAL VIEW



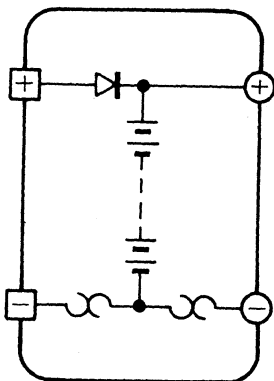
TK-320/320(DM)

KNB-5 / 6 / 7 (Ni-Cd BATTERY)

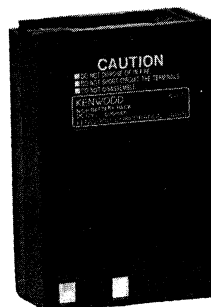
**KNB-5
EXTERNAL VIEW**



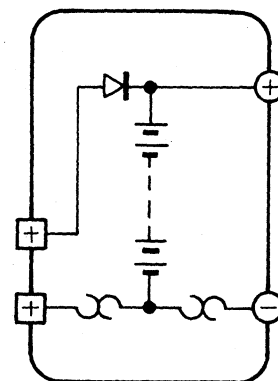
**KNB-5
CIRCUIT DIAGRAM**



**KNB-7
EXTERNAL VIEW**



**KNB-7
CIRCUIT DIAGRAM**



KNB-5 SPECIFICATIONS

Electrical characteristic

Voltage 7.2V (1.2V x 6)

Charging current 600mAh

Dimensions 58 H x 55.5 (58.5) H x 29.5 D (mm)

Weight 180g

KNB-7 SPECIFICATIONS

Electrical characteristic

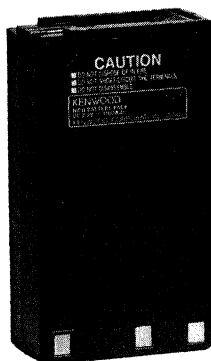
Voltage 12V (1.2V x 10)

Charging current 600mAh

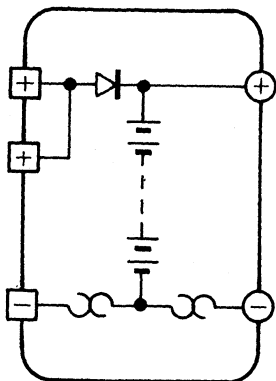
Dimensions 58 W x 84 (87) H x 29.5 D (mm)

Weight 270g

**KNB-6
EXTERNAL VIEW**



**KNB-6
CIRCUIT DIAGRAM**



KNB-6 SPECIFICATIONS

Electrical characteristic

Voltage 7.2V (1.2V x 6)

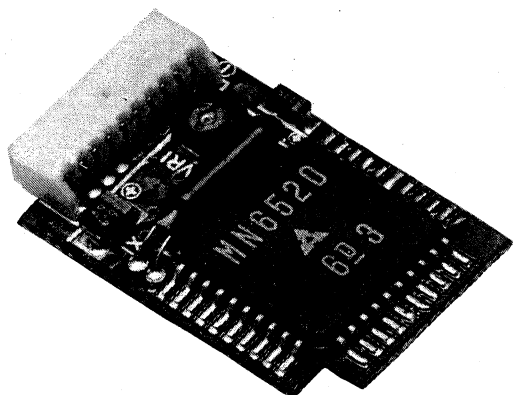
Charging current 1100mAh

Dimensions 58 W x 98.5 (101.5) H x 29.5 D (mm)

Weight 300g

KQT-8 (QUIET TALK / CTCSS UNIT)

KQT-8 EXTERNAL VIEW



KQT-8 PARTS LIST

* : New Parts

Ref. No.	New Parts	Parts No.	Description
QT/CTCSS UNIT (X52-3100-00)			
C1		CK73FB1H102K	Chip C 1000pF K
C2		C92-0010-05	Tantal 6.8μF 6.3WV
C3	*	C90-2082-05	Tantal 22μF 4.0WV
C4, 5		CK73EB1E104K	Chip C 0.1μF K
C6		CK73EB1H223K	Chip C 0.022μF K
C7		CK73EB1E104K	Chip C 0.1μF K
C8, 9		CC73FCH1H150J	Chip C 15pF J
C10		CK73FB1H102K	Chip C 1000pF K
C11		CK73FB1E473M	Chip C 0.047μF K
C12		C92-0507-05	Chip tan. 4.7μF 6.3WV
C13	*	C92-0510-05	Chip tan. 3.3μF 4.0WV
	*	E40-5121-05	Pin connector (10P)
X1		L77-1313-05	X'tal resonator 4.194304MHz
R1-10		RK73FB2A000J	Chip resistor
R12-14		RK73FB2A000J	Chip resistor
VR1	*	R12-3460-05	Trimming pot. 33kΩ
Q1		DTC144TK	Digital transistor
Q2		DTA114EK	Digital transistor
Q3		2SC2712(GR)	Chip transistor
IC1		MN6520	IC
IC2		MN4094BS	IC

KQT-8 REFERENCE DATA

Tone frequency and MN6520 (IC1) relationship

Tone frequency (Hz)	MN6520 terminal					
	S6	S5	S4	S3	S2	S1
	MN4094BS terminal					
	Q1	Q2	Q3	Q4	Q7	Q8
67.0	L	H	H	H	L	H
71.9	L	H	H	H	L	L
74.4	L	H	H	L	H	H
77.0	L	H	H	L	H	L
79.7	L	H	H	L	L	H
82.5	L	H	H	L	L	L
85.4	L	H	L	H	H	H
88.5	L	H	L	H	H	L
91.5	L	H	L	H	L	H
94.8	H	H	H	L	L	H
100.0	H	H	H	L	L	L
103.5	H	H	L	H	H	H
107.2	H	H	L	H	H	L
110.9	H	H	L	H	L	H
114.8	H	H	L	H	L	L
118.8	H	H	L	L	H	H
123.0	H	H	L	L	H	L
127.3	H	H	L	L	L	H
131.8	H	H	L	L	L	L
136.5	H	L	H	H	H	H
141.3	H	L	H	H	H	L
146.2	H	L	H	H	L	H
151.4	H	L	H	H	L	L
156.7	H	L	H	L	H	H
162.2	H	L	H	L	H	L
167.9	H	L	H	L	L	H
173.8	H	L	H	L	L	L
179.9	H	L	L	H	H	H
186.2	H	L	L	H	H	L
192.8	H	L	L	H	L	H
203.5	H	L	L	H	L	L
210.7	H	L	L	L	H	H
218.1	H	L	L	L	H	L
225.7	H	L	L	L	L	H
233.6	H	L	L	L	L	L
241.8	L	H	H	H	H	H
250.3	L	H	H	H	H	L

Table 2

KQT-8 FINE ADJUSTMENT OF TONE FREQUENCY

The tone frequency can be fine adjusted with an interval of 0.5% step over the range of 0 to +1.5%. Ground the T1 (pin 10) and T2 (pin 9) of IC1 to obtain the desired frequency.

	T1	T2
0%	X	X
+0.5%	O	X
+1.0%	X	O
+1.5%	O	O

O : GND, X : OPEN

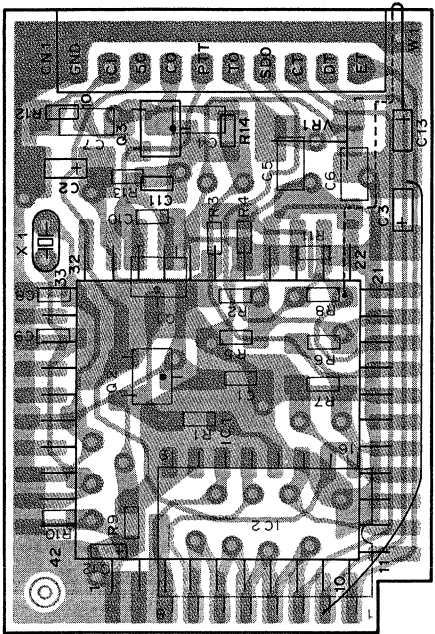
Table 1

TK-320/320(DM)

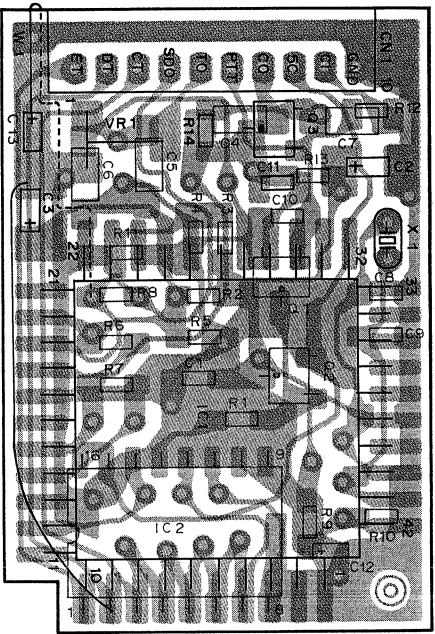
KQT-8 (QUIET TALK / CTCSS UNIT)

KQT-8 PC BOARD VIEWS

Component side view



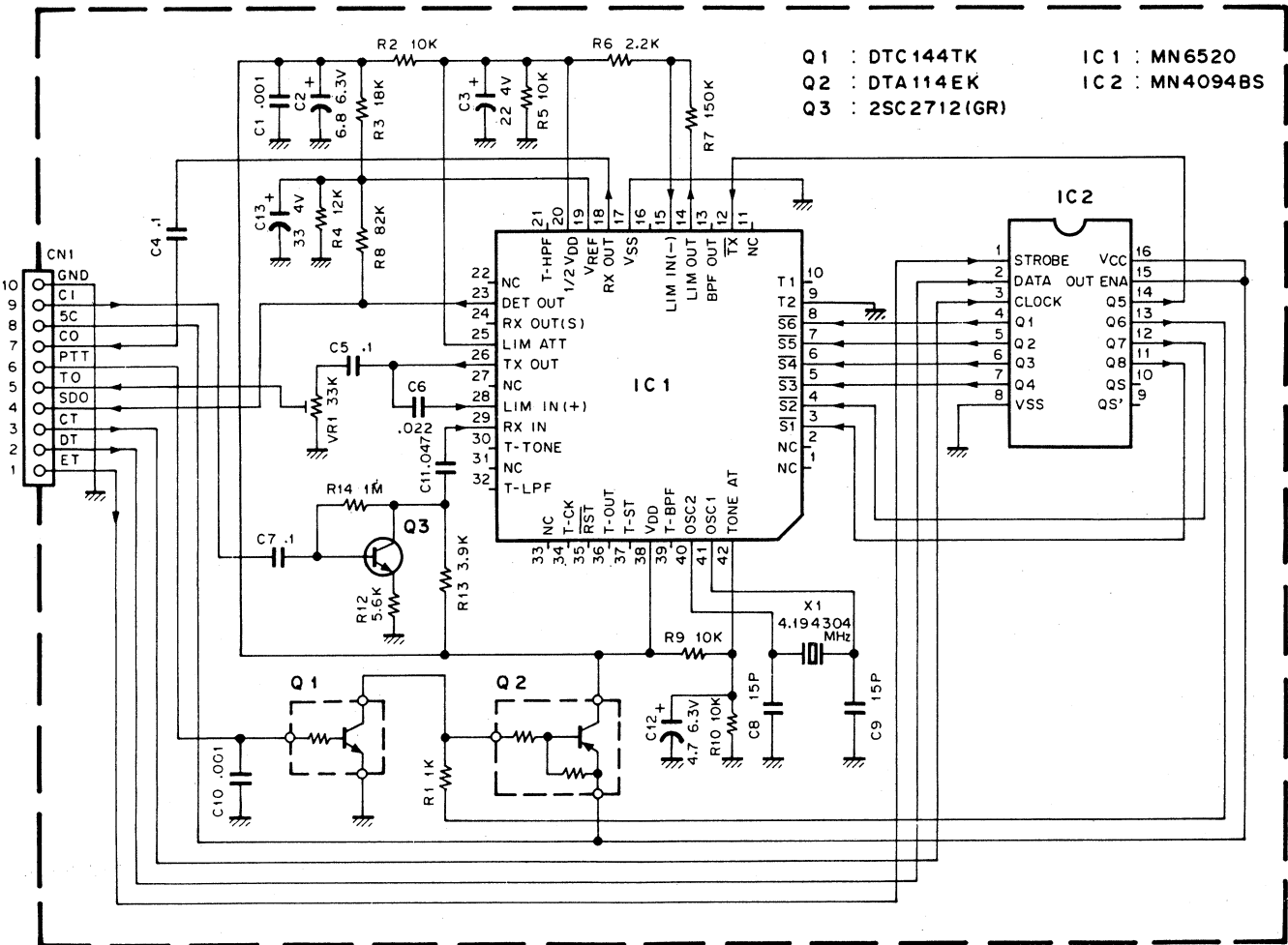
Foil side view



■ : Component side
■ : Foil side

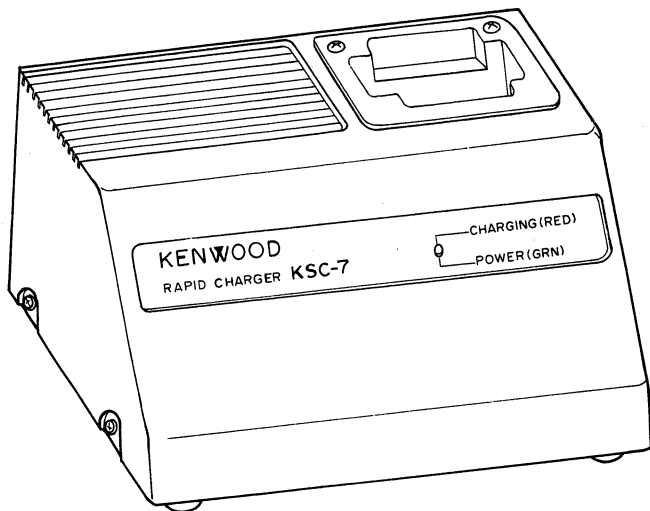
KQT-8 CIRCUIT DIAGRAM

QT/CTCSS UNIT (X52-3100-00)



KSC-7 (RAPID CHARGER)

KSC-7 EXTERNAL VIEW



KSC-7 CIRCUIT DESCRIPTION

1. General

The KSC-7 is a rapid charger for the KNB-5, KNB-6 and KNB-7 Ni-Cd batteries for the TK-320.

2. Theory of Operation

The operation of each block is explained below.

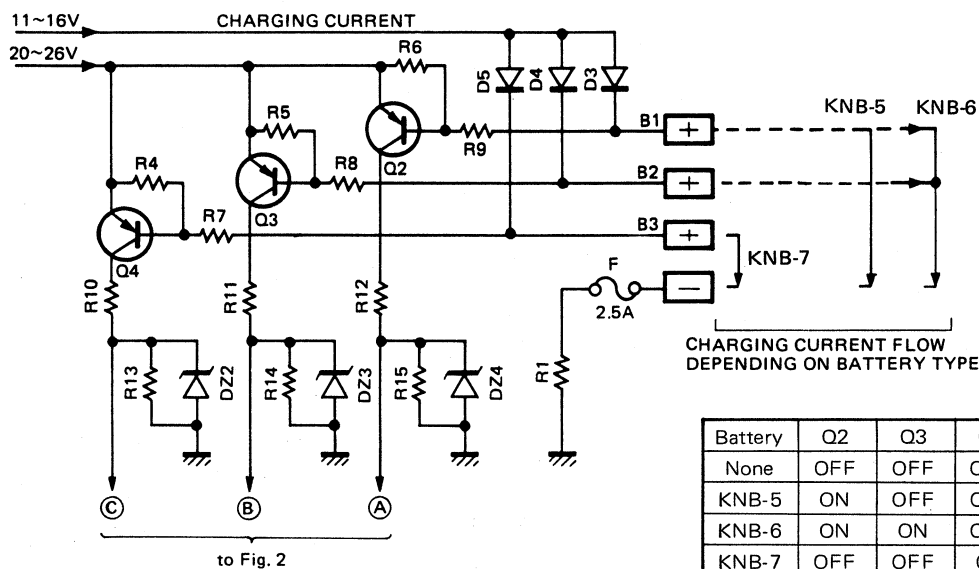
• +11V AVR Circuit

This AVR circuit, consisting of a 2SD600F transistor (Q1) and GZA11Y Zener diode (DZ1) provides an output of approximately +11V as the reference voltage for the charging circuit consisting of IC2 to IC5.

• Battery Pack Detect Circuit

This circuit detects whether a battery pack is inserted in the charger. Outputs from this circuit are routed to the reset circuit and the battery recognition circuit.

When a KNB-5 is inserted in the charger, a small amount of current flows from Q2 : 2SA608E through R9 to the charging terminal B1 and Q2 turns on. As a result, an output of approximately 11V appears at (A) in Fig. 1. Similarly when a KNB-6 is inserted Q3 : 2SA608E turns on and approximately 11V is provided at output (B). When a KNB-7 is inserted Q4 : 2SA608E turns on and approximately 11V is provided at output (C).



CHARGING CURRENT FLOW
DEPENDENT ON BATTERY TYPE

Battery	Q2	Q3	Q4
None	OFF	OFF	OFF
KNB-5	ON	OFF	OFF
KNB-6	ON	ON	OFF
KNB-7	OFF	OFF	ON

Table 1

Fig. 1 Battery Pack Detect Circuit Block Diagram

KSC-7 (RAPID CHARGER)

● **Reset, Charge Status Memory and Display Circuit**

The reset circuit initializes the charging status memory circuit.

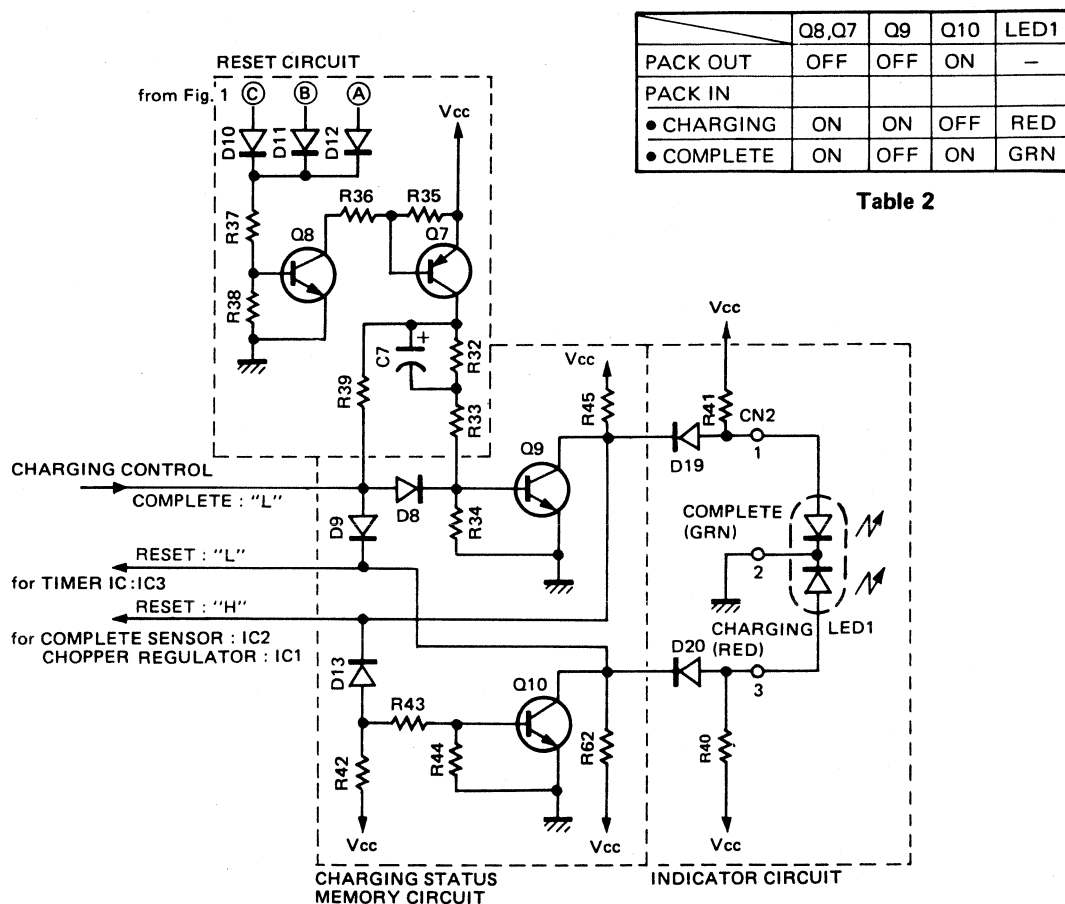


Fig. 2 Reset Circuit/Charge Status Memory Circuit/Display Circuit Block Diagram

The charge status memory circuit is an R-S flip-flop configured from transistors and resistors. The two states of the flip-flop are called COMPLETE and CHARGING. Outputs from the flip-flop drive the LED in the indicator circuit and reset the timer, complete sensor, and chopper regulator. In the COMPLETE state Q9 : 2SC536E is off and Q10 : 2SC536E is on. In the CHARGING state Q9 is on and Q10 is off.

When a battery pack is not inserted, Q8 : 2SC536E and Q7 : 2SC536E turn off. As there is no base voltage to Q9, Q9 also turns off. The base of Q10 receives enough bias from Vcc to turn on, resulting in 0V at the collector. The current flow through R41 to the COMPLETE indicator in LED1 which glows green, because of Q9 if off.

When the battery pack is inserted Q8 and Q7 turn on. As soon as Q7 turns on, charging current flows through R33, R34, and Q9 to C7 and Q9 turns on. The base voltage of Q10, which is connected to Q9 through diode D13, then drops and Q10 turns off. Since Q10 is off, current flows through R40 to the CHARGING indicator in LED1, which glows red to indicate that the battery is charging. When charging of C7 is completed, on-current continues to flow to the base of Q9 through R39 and D8.

When charging is completed the complete sensor (IC2) outputs a Low ("L") signal that ends the flow of current to the base of Q9, turning Q9 off. As a result current flows through R41 to the COMPLETE indicator in LED1, which glows green to indicate that charging is complete.

KSC-7 (RAPID CHARGER)

● Sensor Level Switching Circuit

This circuit receives the output of the battery recognition circuit and aligns the voltages supplied to the charging status detect circuit according to the battery type (voltage) so that they are nearly equal at completion of charging.

	SHIFT Es (V)	Q11	Q12
KNB-5	2.0	OFF	ON
KNB-6	2.0	OFF	ON
KNB-7	7.6	OFF	OFF

Table 5

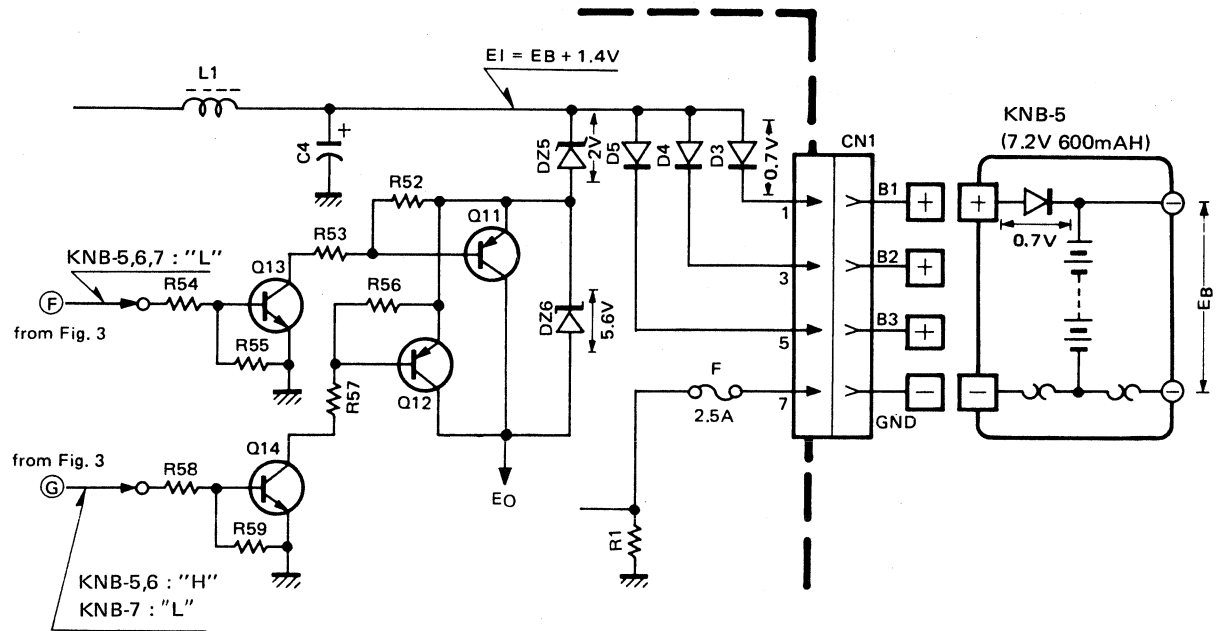


Fig. 5 Sensor Level Switching Circuit Block Diagram

The pin voltages while the Ni-Cd battery is charging are approximately 1.2 times the voltages at the completion of charging. (See **Figure 6**.)

The battery terminal voltage EB is as follows:
Approximately 14.4V for the KNB-7
Approximately 8.6V for the KNB-5, 6
The charging line voltage EI is the EB voltage plus a 1.4V voltage drop added by a diode.

$EI = EB + 1.4V \dots \dots (1)$

The EI voltage is output with a level shift as the voltage EO to the charging status detect circuit via Zener diode DZ6 and diodes D17 and D18. The amount of the shift is controlled by switching Q11 : 2SA608E and Q12 : 2SA608E on and off. (See **Table 5**.) If Eq. (1) is substituted into EO in **Table 5**, the results are:

KNB-5,6 : $EO = EB - 6.2V$
KNB-7 : $EO = EB - 0.6V$

At the completion of charging the value is approximately 8V.

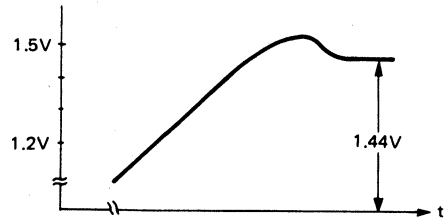


Fig. 6 The pin voltages while the Ni-CD Battery is charging

KSC-7 (RAPID CHARGER)

● Charging Status Detect Circuit

This circuit detects the completion of charging and outputs a signal to stop charging. When no battery pack is inserted or charging is completed, a High ("H") Reset signal is applied to D15. When a battery is inserted the Reset signal applied to D15 is cleared. When the Reset signal is cleared, pin 4 of IC2 : KCH-1003 holds the reset state due to the charge in C8 for the duration of the R46-C8 time constant, then goes "L" to clear the reset state. Pins 8 and 9 of IC2 receive divided portions of the battery voltage.

These inputs are tracked as the charging is performed in the long-term memory capacitor "MD". As the Ni-Cd battery charges, the battery voltage reaches a peak, then declines. (See Fig. 6.) The MD stores the peak voltage, which is compared with the divided voltages at pins 8 and 9. When the difference ΔV is the same, a "L" signal is output from pin 11 to indicate that charging is complete. The signal indicating completion of charging is applied to the charging status memory circuit.

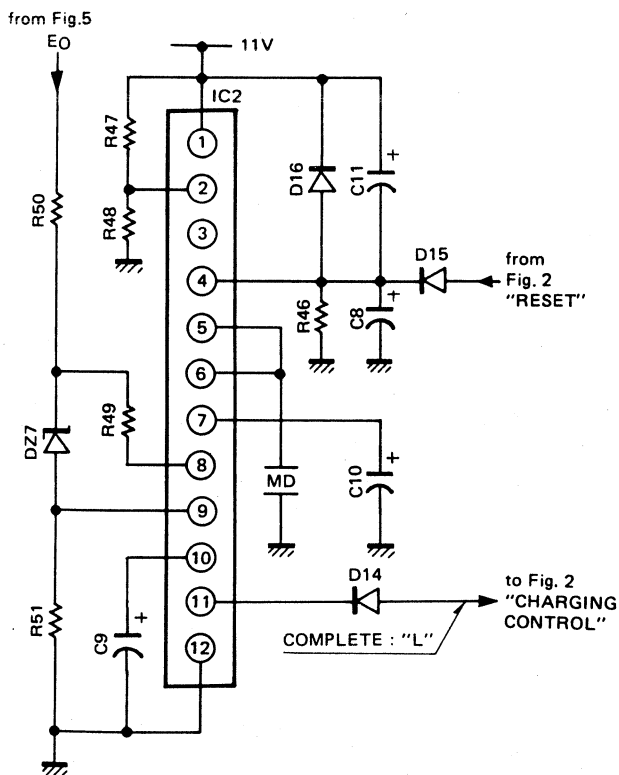


Fig. 7 Charging Status Detect Circuit Block Diagram

● Timer Circuit

Battery defects may result in charging continuing indefinitely without completion, so this timer outputs a signal that stops charging approximately 1.7 hours after charging begins. When charging begins and the Reset signal is cleared at pin 3, IC3 : AN6780 begins counting. At the first count of 16384 pin 6 goes from "H" to "L".

The output from pin 6 is connected to the Stop input (pin 2), so the output of IC3 is held in the "L" state until IC3 receives another Reset signal (for example, when the battery is removed).

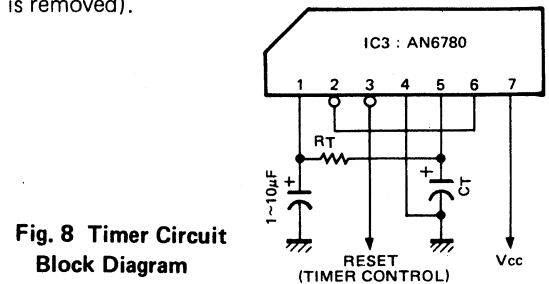


Fig. 8 Timer Circuit Block Diagram

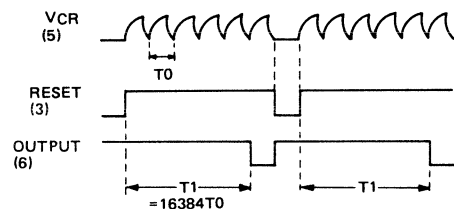


Fig. 9

TIMER TIME T1(s) $\approx 11RT(K\Omega) \cdot CT(\mu F)$
 TIMER TIME T1(s) $\approx 11 \times 47(K\Omega) \cdot 10(\mu F) = 5170(s)$

● Voltage Comparator Circuit

This circuit monitors the output (EO) of the sensor level switching circuit and indirectly detects abnormal conditions in the battery pack connected to the charging terminal. When the EO voltage falls to 5.2V or lower, the charging control line goes "L" to halt charging.

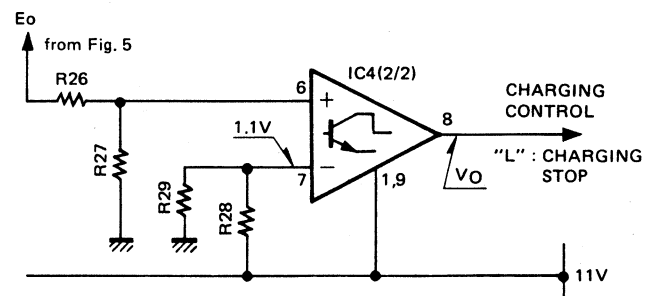


Fig. 10 Voltage Comparator Circuit Block Diagram

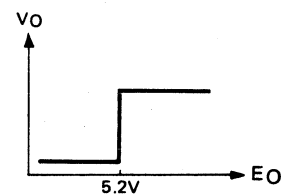


Fig. 11

KSC-7 (RAPID CHARGER)

* New Parts

Parts without Parts No. are not supplied.

Les articles non mentionnés dans le Parts No. ne sont pas fournis.

Teile ohne Parts No. werden nicht geliefert.

KSC-7 PARTS LIST

Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名 / 規格	Desti- nation 仕向	Re- marks 備考
KSC-7						
1	1A	*	A02-0816-08	CASE		
2	1A,1B	*	A02-0817-05	BATTERY POCKET		
3	1B		B46-0418-10	WARRANTY CARD		
4	1B	*	B50-8186-08	INSTRUCTION MANUAL (KSC-4/5)		
5	1B	*	E23-0604-05	TERMINAL		
6	2A		E30-2038-08	AC CORD		
8	2B	*	H01-8129-08	ITEM CARTON CASE		
9	2B		H10-2584-02	POLYSTYRENE FOAMED FIXTURE (L)		
10	2B		H10-2585-02	POLYSTYRENE FOAMED FIXTURE (R)		
11	3A		J02-0439-05	FOOT		
12	3A		J39-0424-05	SPACER		
T1	2A		L01-8081-08	POWER TRANSFORMER (AC120V)	K,M2	
T1	2A		L01-8112-08	POWER TRANSFORMER (AC220V)	M	
A	3A		N30-3006-41	MACHINE SCREW (M3 X 6)		
B	2A,1B		N34-4006-46	MACHINE SCREW (M4 X 6 Tr)		
C	2A,1B		N35-4006-45	MACHINE SCREW (M4 X 6 Bi) BLK		
D	2A		N87-3008-46	TAPTITE SCREW (φ3 X 8 Br)		
E	1A		N89-3008-45	TAPTITE SCREW (φ3 X 8 Bi) BLK		
7	3B	*	W02-0819-05	CHARGE CONTROL UNIT		
CHARGE CONTROL UNIT (W02-0819-05)						
C1			CE04EW1V222M	ELECTRO 2200μF 35WV		
C2			CE04EW1C470M	ELECTRO 47μF 16WV		
C3			CE04EW1H010M	ELECTRO 1μF 50WV		
C4			CE04EW1E471M	ELECTRO 470μF 25WV		
C5,6			CE04EW1C100M	ELECTRO 10μF 16WV		
C7			CE04EW1A101M	ELECTRO 100μF 10WV		
C8			CE04EW1C100M	ELECTRO 10μF 16WV		
C9,10			CE04EW0J101M	ELECTRO 100μF 6.3WV		
C11			CE04EW1C330M	ELECTRO 33μF 16WV		
C12			CK45B1H102K	CERAMIC 0.001μF 50WV		
C14			CE04EW1H010M	ELECTRO 1μF 50WV		
C15			C91-0757-05	CERAMIC 0.001μF K		
C16-18			CK45F1H103Z	CERAMIC 0.01μF Z		
MD			C91-1038-08	ELECTRO		
F1		*	F06-2522-05	FUSE (2.5A)	M,M2	
F1		*	F06-2523-05	FUSE (2.5A)	K	

E: Scandinavia & Europe H: Audio Club K: USA P: Canada W: Europe

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UE: AAFES(Europe) X: Australia

⚠ indicates safety critical components.

KSC-7 (RAPID CHARGER)

× New Parts

Parts without Parts No. are not supplied.

Les articles non mentionnés dans le Parts No. ne sont pas fournis.

Teile ohne Parts No. werden nicht geliefert.

Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名 / 規格	Desti- nation 仕向	Re- marks 備考
L1			L33-0694-08	CHOKE COIL (470μH)		
R1			R92-0683-08	FL-PROOF 0.15Ω 4W		
R2			RD14CB2E202J	RD 2K 1/4W		
R3			RD14BB2E302J	RD 3K 1/4W		
R4,5			RD14CB2E103J	RD 10K 1/4W		
R6-9			RD14BB2E103J	RD 10K 1/4W		
R10-12			RD14BB2E202J	RD 2K 1/4W		
R13			RD14BB2E303J	RD 30K 1/4W		
R14,15			RD14CB2E303J	RD 30K 1/4W		
R16			RD14CB2E204J	RD 200K 1/4W		
R17			RD14CB2E391J	RD 390 1/4W		
R18			RD14CB2E362J	RD 3.6K 1/4W		
R19			RD14CB2E113J	RD 11K 1/4W		
R20			RD14BB2E102J	RD 1K 1/4W		
R21			RD14CB2E203J	RD 20K 1/4W		
R22			RD14BB2E203J	RD 20K 1/4W		
R23			RD14BB2E512J	RD 5.1K 1/4W		
R24			RD14BB2E203J	RD 20K 1/4W		
R25			RD14CB2E103J	RD 10K 1/4W		
R26			RD14BB2E103J	RD 10K 1/4W		
R27			RD14CB2E272J	RD 2.7K 1/4W		
R28			RD14CB2E912J	RD 9.1K 1/4W		
R29			RD14CB2E102J	RD 1K 1/4W		
R30			RD14BB2E563J	RD 56K 1/4W		
R31			RD14BB2E202J	RD 2K 1/4W		
R32			RD14CB2E204J	RD 200K 1/4W		
R33			RD14BB2E103J	RD 10K 1/4W		
R34			RD14BB2E682J	RD 6.8K 1/4W		
R35			RD14CB2E203J	RD 20K 1/4W		
R36			RD14BB2E303J	RD 30K 1/4W		
R37			RD14CB2E203J	RD 20K 1/4W		
R38			RD14CB2E103J	RD 10K 1/4W		
R39			RD14BB2E103J	RD 10K 1/4W		
R40			RD14BB2E162J	RD 1.6K 1/4W		
R42			RD14CB2E103J	RD 10K 1/4W		
R43			RD14BB2E203J	RD 20K 1/4W		
R44,45			RD14CB2E103J	RD 10K 1/4W		
R46			RD14CB2E825J	RD 8.2M 1/4W		
R47			RD14CB2E104J	RD 100K 1/4W		
R48			RD14CB2E122J	RD 1.2K 1/4W		
R49			RD14BB2E563J	RD 56K 1/4W		

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KSC-7 (RAPID CHARGER)

× New Parts

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Teile ohne Parts No. werden nicht geliefert.

Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名 / 規格	Desti- nation 仕向	Re- marks 備考
R50			RD14BB2E431J	RD 430 1/4W		
R51			RD14CB2E130J	RD 13 1/4W		
R52			RD14CB2E203J	RD 20K 1/4W		
R53,54			RD14BB2E203J	RD 20K 1/4W		
R55			RD14CB2E103J	RD 10K 1/4W		
R56-58			RD14BB2E203J	RD 20K 1/4W		
R59			RD14CB2E103J	RD 10K 1/4W		
R61			RD14CB2E104J	RD 100K 1/4W		
R62			RD14CB2E103J	RD 10K 1/4W		
R63			RD14BB2E302J	RD 3K 1/4W		
R64			RD14BB2E431J	RD 430 1/4W		
D1-5			DSA26B	DIODE		
D6-16			DS442	DIODE		
D19-21			DS442	DIODE		
DZ1		*	GZA11Y	ZENER DIODE (11V)		
DZ2-4		*	GZA10Z	ZENER DIODE (10V)		
DZ5		*	GZA2.0X	ZENER DIODE (2V)		
DZ6		*	GZA5.6X	ZENER DIODE (5.6V)		
DZ7		*	GZA7.5Y	ZENER DIODE (7.5V)		
DZ8		*	GZA3.0X	ZENER DIODE (3V)		
IC1		*	STK772B	IC (CHOPPER REGULATOR)		
IC2		*	KCH-1003	IC (VOLTAGE SENSOR)		
IC3			AN6780	IC (TIMER)		
IC4			LA6393S	IC (DUAL OP IC)		
IC5			LC4011B	IC (QUADRUPLE NAND GATE)		
Q1		*	2SD600F,KF	TRANSISTOR		
Q2-5		*	2SA608E,F	TRANSISTOR		
Q6		*	2SC536E,F	TRANSISTOR		
Q7		*	2SA608E,F	TRANSISTOR		
Q8-10			2SC536E,F	TRANSISTOR		
Q11,12			2SA608E,F	TRANSISTOR		
Q13,14			2SC536E,F	TRANSISTOR		
LED1	2A		SLP-540D	LED (RED/GRN)		

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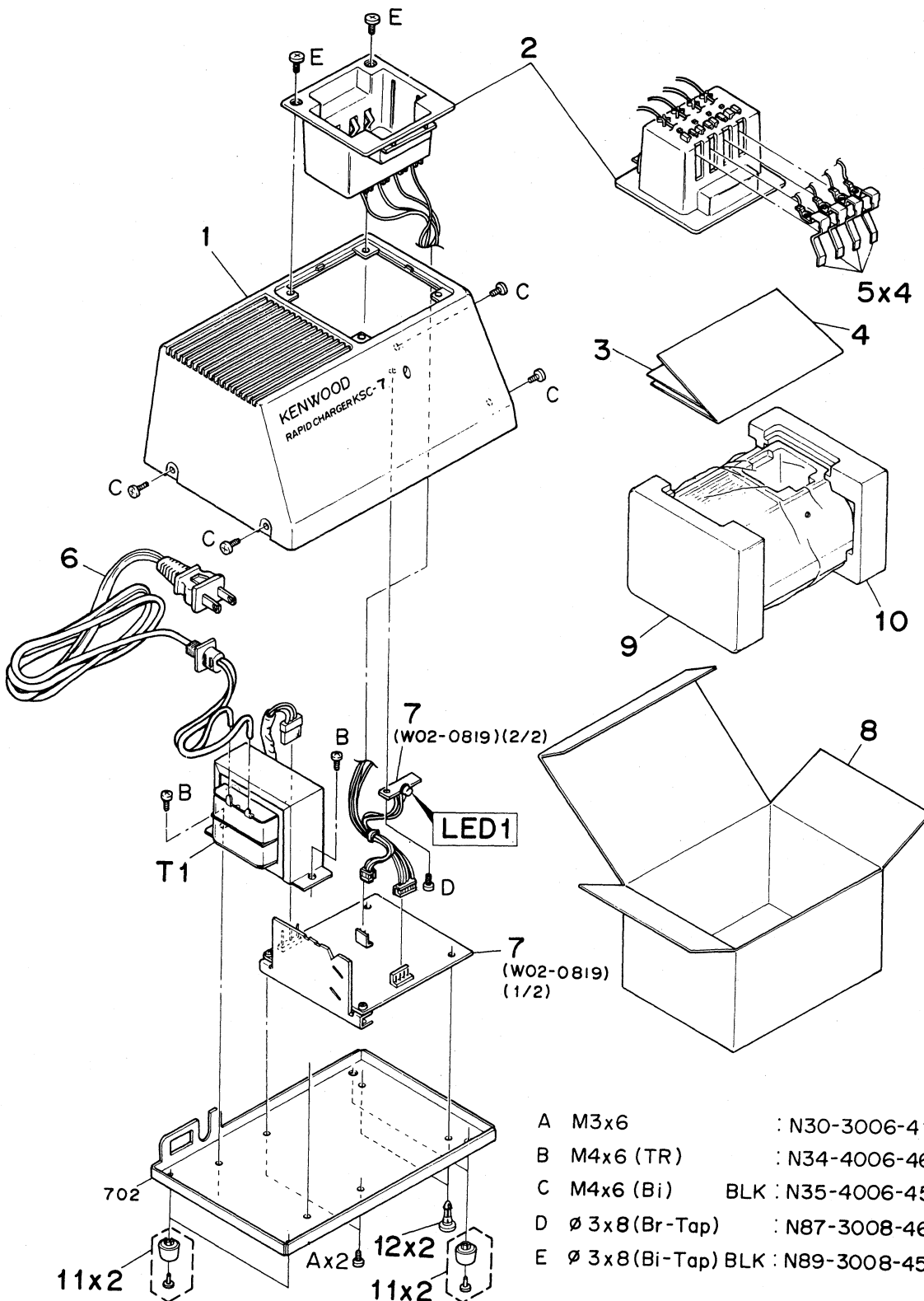
UE: AAFES(Europe) X: Australia

 indicates safety critical components.

KSC-7

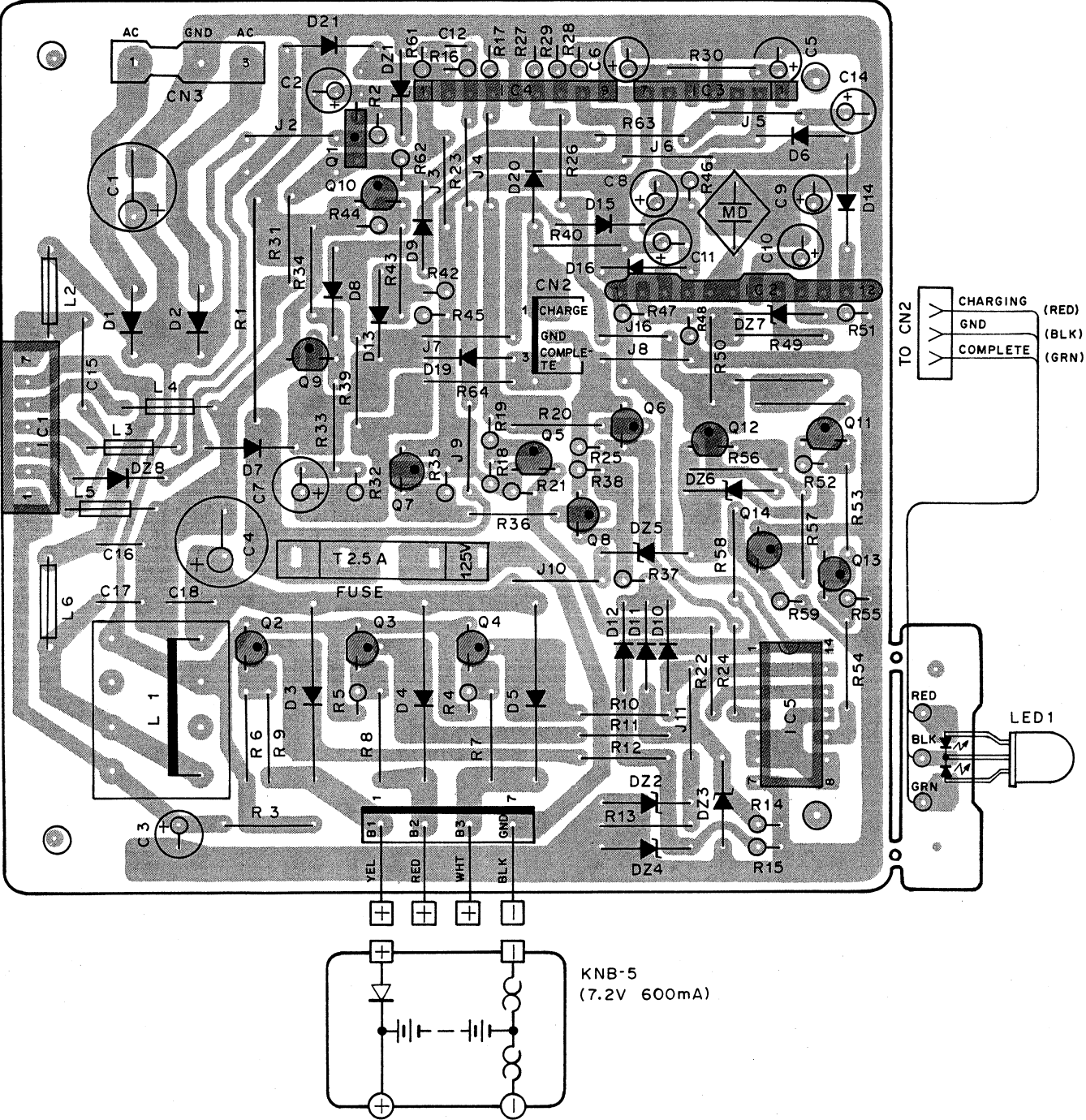
DISASSEMBLY/PACKING

KSC-7 (RAPID CHARGER)



KSC-7 (RAPID CHARGER)

KSC-7 PC BOARD VIEW



Q1 : 2SD600F,KF Q2-5,7,11,12 : 2SA608E,F Q6,8-10,13,14 : 2SC536E,F
IC1 : STK772B IC2 : KCH-1003 IC3 : AN6780 IC4 : LA6393S IC5 : LC4011B
D1-5 : DSA26B D6-16,19-21 : DS442
DZ1 : GZA11Y DZ2-4 : GZA10Z DZ5 : GZA2.0X DZ6 : GZA5.6X DZ7 : GZA7.5Y DZ8 : GZA3.0X

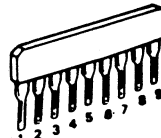
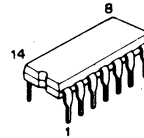
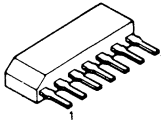
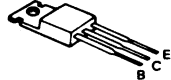
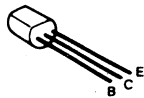
2SA608E
2SA608F

2SC536E 2SD600F
2SC536F 2SD600KF

AN6780

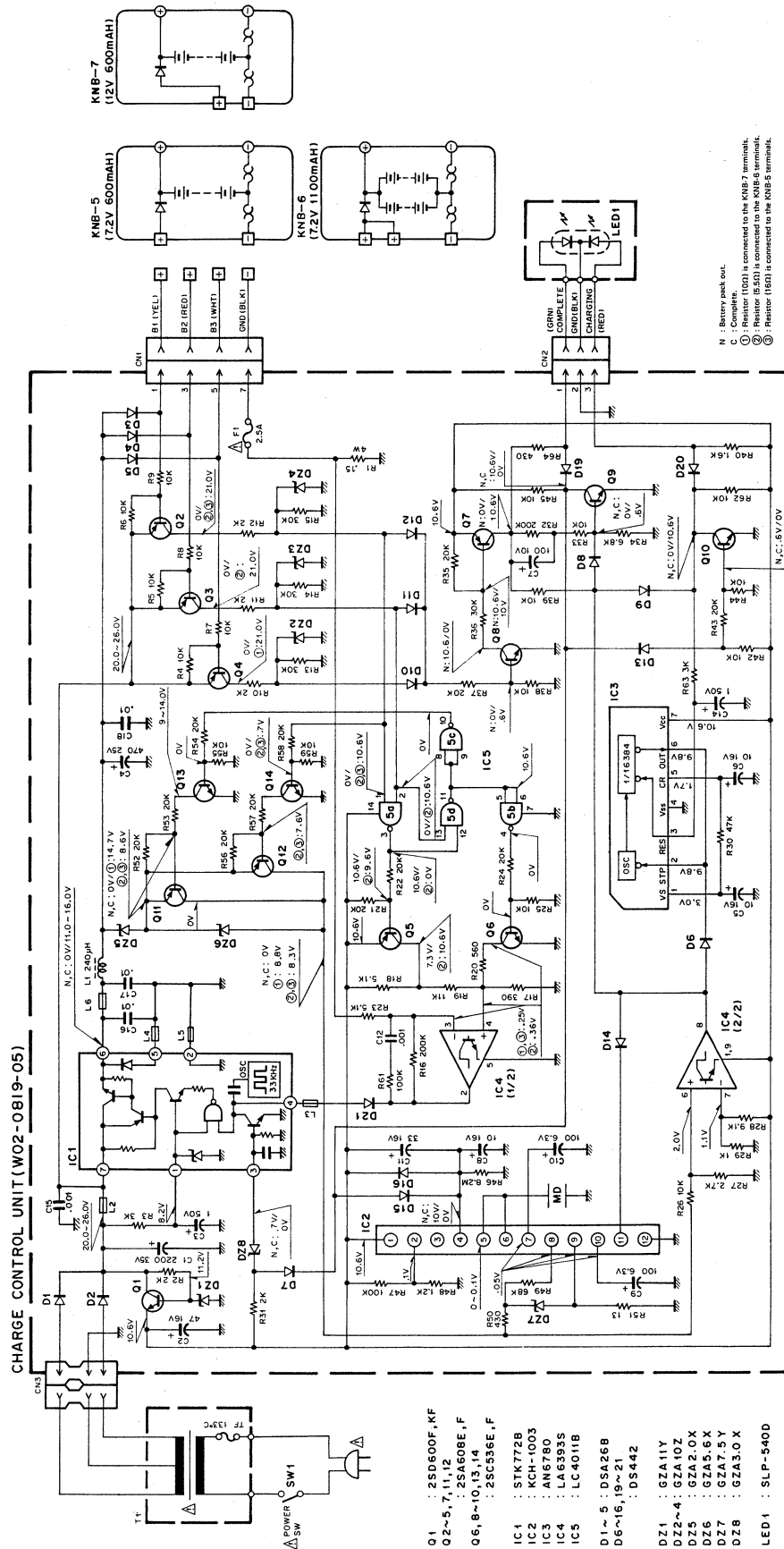
LC4011B

LA6393S



KSC-7 (RAPID CHARGER)

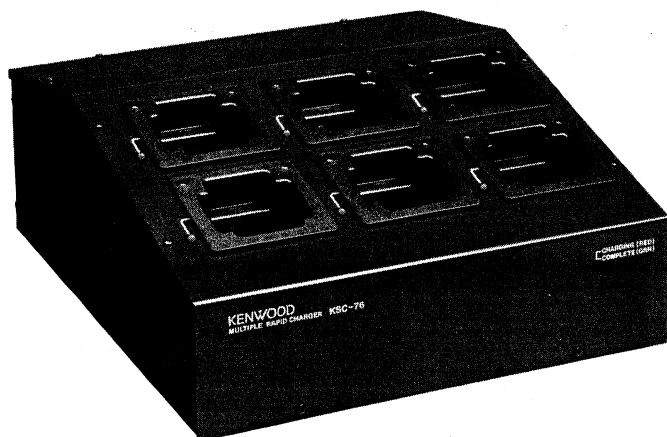
KSC-7 CIRCUIT DIAGRAM



TK-320/320(DM)

KSC-76 (MULTIPLE RAPID CHARGER)

KSC-76 EXTERNAL VIEW



KSC-76 PARTS LIST

Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名 / 規格	Desti- nation 仕 向	Re- marks 備考
1	1A		A02-0817-05	BATTERY POCKET		
2	3A		A10-1283-01	CHASSIS		
3	2A	*	A20-2661-01	PANEL		
4	2A		A23-1496-03	REAR PANEL		
8	1A		B30-0853-05	LED		
9	2A	*	B40-3819-04	MODEL NAME PLATE	KM2	
9	2A	*	B40-3820-04	MODEL NAME PLATE	M	
11	2A	*	B41-0658-14	CAUTION LABEL		
-			B46-0418-10	WARRANTY CARD	K	
-		*	B50-8233-00	INSTRUCTION MANUAL		
15	1A		E23-0604-05	TERMINAL		
16	2B		E30-0780-05	AC POWER CORD		
-		*	H01-8187-04	ITEM CARTON BOX		
-		*	H10-2623-11	POLYSTYRENE FOAMED FIXTURE(L)		
-		*	H10-2629-11	POLYSTYRENE FOAMED FIXTURE(R)		
-			H20-1403-03	PROTECTION COVER (KSC-76)		
30	3A		J02-0323-05	FOOT		
32	1A		J19-1423-05	LEAD HOLDER		
33	3A		J39-0424-05	SPACER		
34	2B		J42-0083-05	POWER CORD BUSHING		
38	2A		L01-8015-05	POWER TRANSFORMER (220V)	MM2	
38	2A		L01-8061-05	POWER TRANSFORMER (120V)	K	
A	3A		N35-3006-41	BINDING HEAD MACHINE SCREW		
B	3A		N89-3008-45	BINDING HEAD TAPTITE SCREW		
C	2A		N09-0631-05	SCREW		
42	3A		W02-0819-05	PCB UNIT		

E: Scandinavia & Europe K: USA P: Canada W: Europe

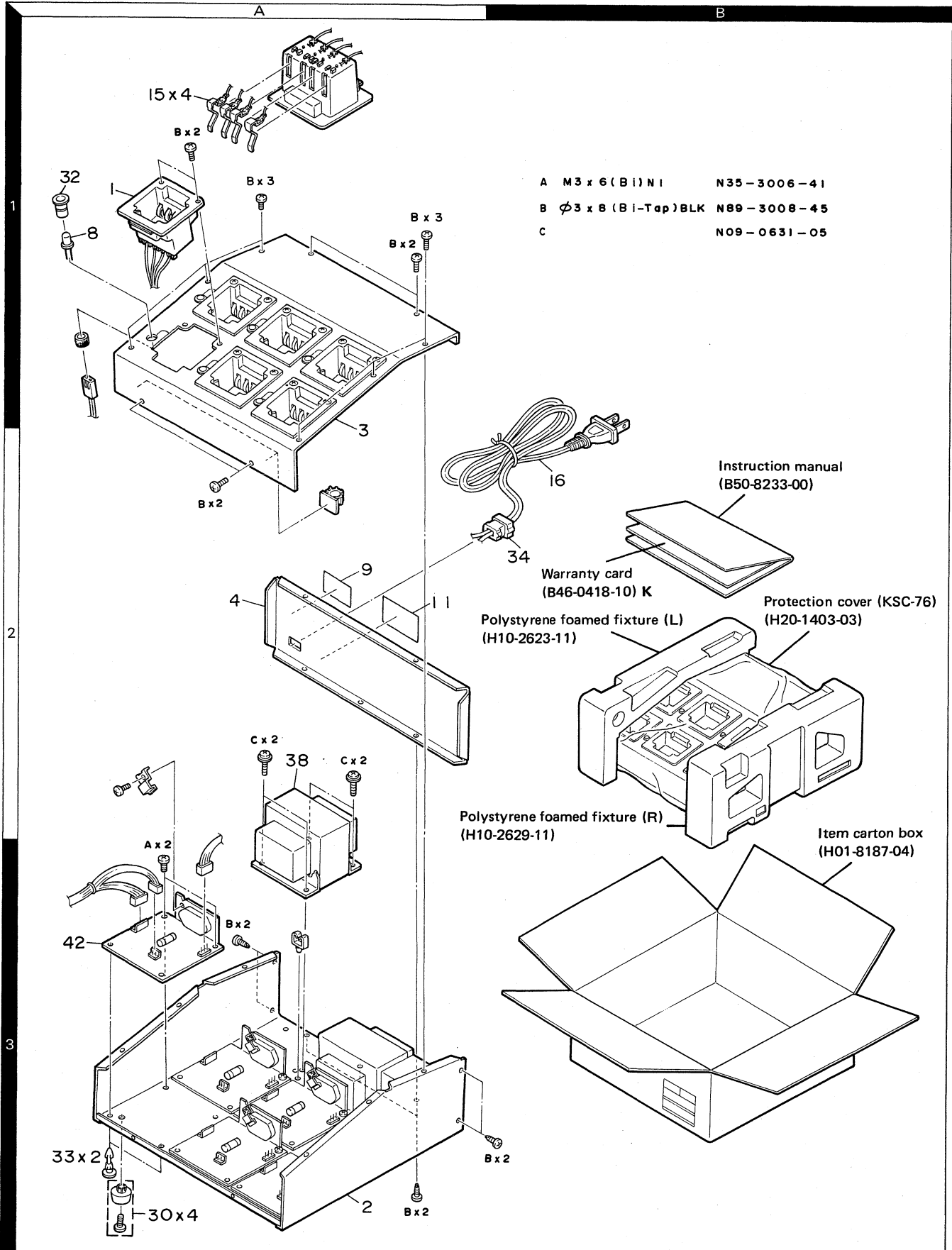
U: PX(Far East, Hawaii) T: England M: Other Areas

UE: AAFES(Europe) X: Australia

⚠ indicates safety critical components.

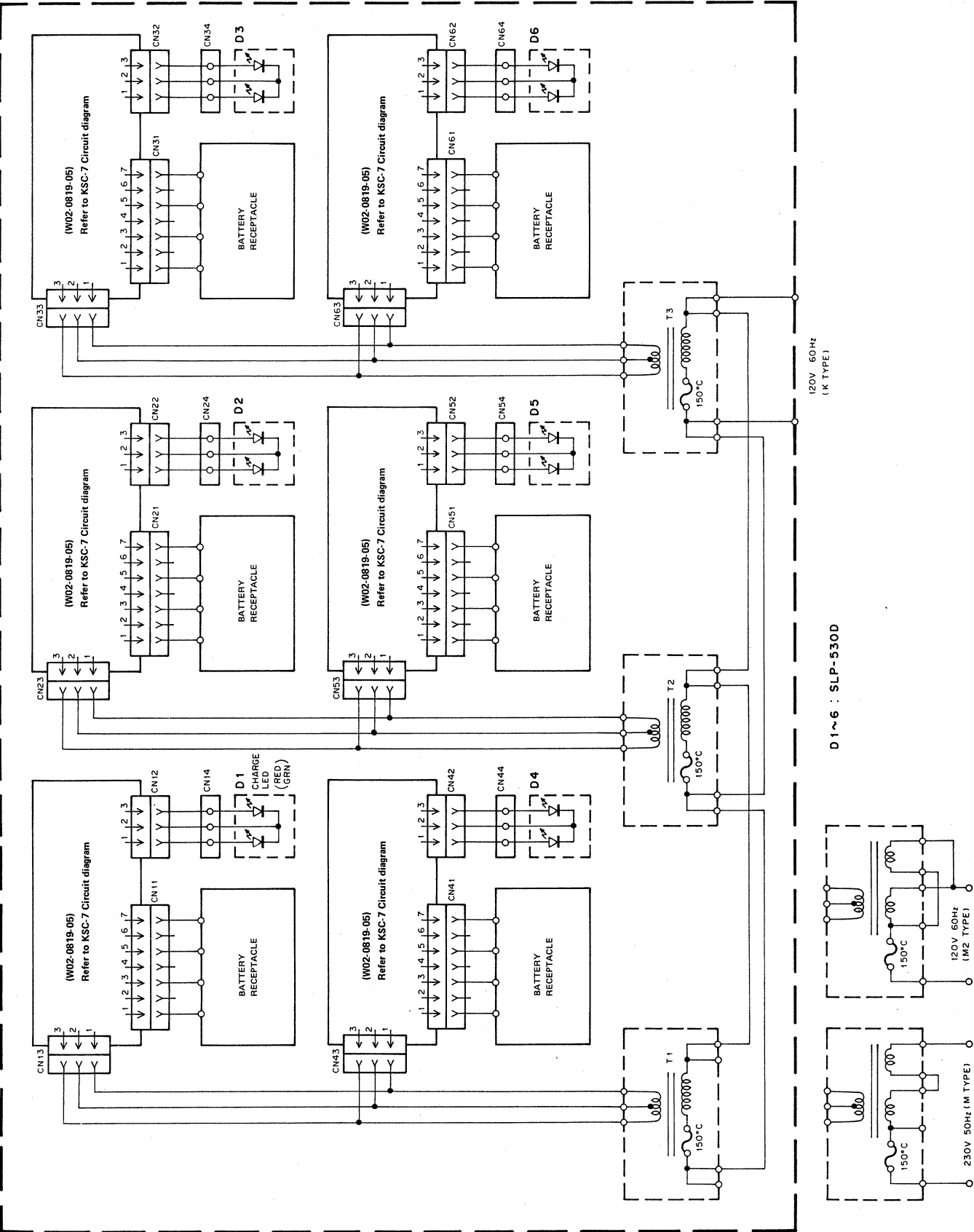
KSC-76 DISASSEMBLY/PACKING

KSC-76 (MULTIPLE RAPID CHARGER)



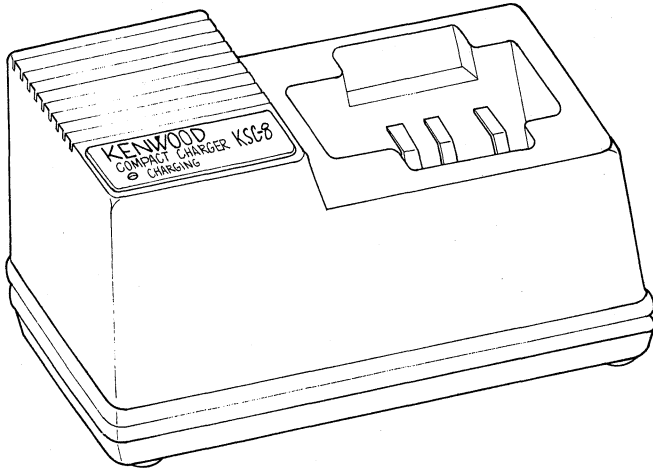
KSC-76 (MULTIPLE RAPID CHARGER)

KSC-76 CIRCUIT DIAGRAM

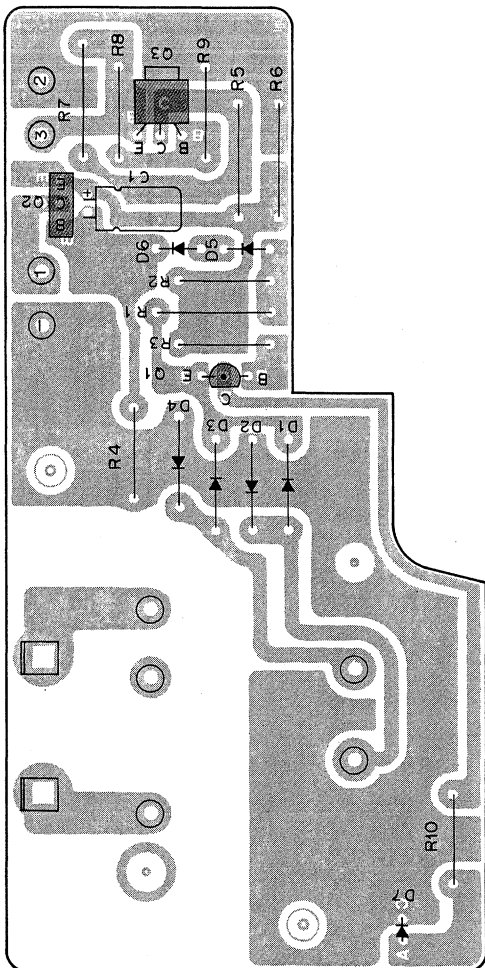


KSC-8 (COMPACT CHARGER)

KSC-8 EXTERNAL VIEW



KSC-8 PC BOARD VIEW

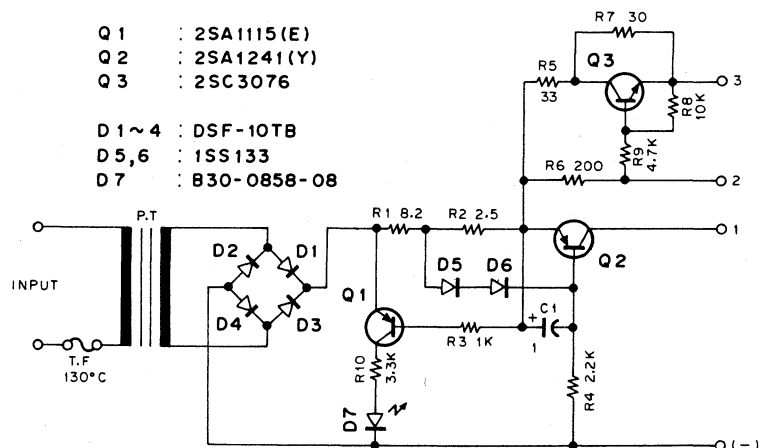


KSC-8 PARTS LIST

* : New Parts

Ref. No.	New Parts	Parts No.	Description
D7	*	A02-0830-08	Case (Upper)
		A02-0832-08	Case (Lower)
	*	B30-0858-08	LED SR615D
	*	B50-8205-08	Instruction manual
	*	B40-3791-08	Model name plate K,M2
	*	B40-3792-08	Model name palte M
	*	B41-0667-08	Caution label
		E30-2097-08	AC power cord
		L01-8027-08	Power transformer 220V M
		L01-8111-08	Power transformer 120V K,M2
Q1		2SA1115(E)	Transistor
		2SA1241(Y)	Transistor
		2SC3076	Transistor
D1-4		DSF-10TB	Diode
		1SS133	Diode

KSC-8 CIRCUIT DIAGRAM



TK-320/320(DM)

KSC-86 (MULTIPLE CHARGER)

KSC-86 EXTERNAL VIEW



KSC-86 PARTS LIST

Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名 / 規格	Desti- nation 仕向	Re- marks 備考
1	1A		A02-0817-05	BATTERY POCKET		
2	3A	*	A10-1290-01	CHASSIS		
3	2A	*	A20-2662-01	PANEL		
4	2A		A23-1497-03	REAR PANEL		
8	1A		B30-0854-05	LED		
9	2A	*	B40-3821-04	MODEL NAME PLATE	KM2	
9	2A	*	B40-3822-04	MODEL NAME PLATE	M	
11	2A		B41-0658-14	CAUTION LABEL		
-			B46-0418-10	WARRANTY CARD	K	
-			B50-8233-00	INSTRUCTION MANUAL		
14	3A	*	E22-0271-05	TERMINAL BOARD		
15	1A		E23-0604-05	TERMINAL		
16	2B		E30-0780-05	AC POWER CORD		
20	2A	*	F20-1007-04	INSULATING BOARD		
25	3A	*	G13-0897-04	FORMED PLATE		
-			G13-0811-04	FORMED PLATE (ACCESSORY)		
-		*	H01-8188-04	ITEM CARTON BOX		
-		*	H10-2605-11	POLYSTYRENE FOAMED FIXTURE(L)		
-		*	H10-2606-11	POLYSTYRENE FOAMED FIXTURE(R)		
-			H20-1414-03	PROTECTION COVER (KSC-86)		
-			H25-0077-03	PROTECTION BAG (ACCESSORY)		
30	3A		J02-0439-05	FOOT		
32	1A		J19-1423-05	LED HOLDER		
33	2A	*	J21-4238-04	MOUNTING HARDWARE		
34	2B		J42-0083-05	POWER CORD BUSHING		
-			J02-0437-04	FOOT (ACCESSORY)		
-			J19-1417-04	HOLDER (ACCESSORY)		
38	2A		L01-8027-05	POWER TRANSFORMER (220V)	M	
38	2A		L01-8111-05	POWER TRANSFORMER (120V)	KM2	
-			N09-0694-05	SCREW (ACCESSORY)		
-			N35-3008-41	BINDING HEAD MACHINE SCREW		
A	2A, 3A		N89-3008-41	BINDING HEAD TAPTITE SCREW		
B	3A		N89-3008-45	BINDING HEAD TAPTITE SCREW(PCB)		
C	2A	*	N89-2612-46	BINDING HEAD TAPTITE SCREW		
42	2A		W02-0805-05	PCB UNIT		

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KSC-86 DISASSEMBLY/PACKING

KSC-86 (MULTIPLE CHARGER)

- A $\phi 3 \times 8$ (Bi-Top) NI N89-3008-41
 B $\phi 3 \times 8$ (Bi-Top) BLK N89-3008-45
 C $\phi 2.6 \times 12$ (Bi-Top) N89-2612-46

* Protection bag (Accessory)
 (H25-0077-03)

Binding head machine screw
 (N35-3008-41)x8
 Holder (Accessory)
 (J19-1417-04)x2
 Screw (Accessory)
 (N09-0694-05)x2
 Foot (Accessory)
 (J02-0437-04)x2
 Formed plate
 (G13-0811-04)x2

Instruction manual
 (B50-8233-00)

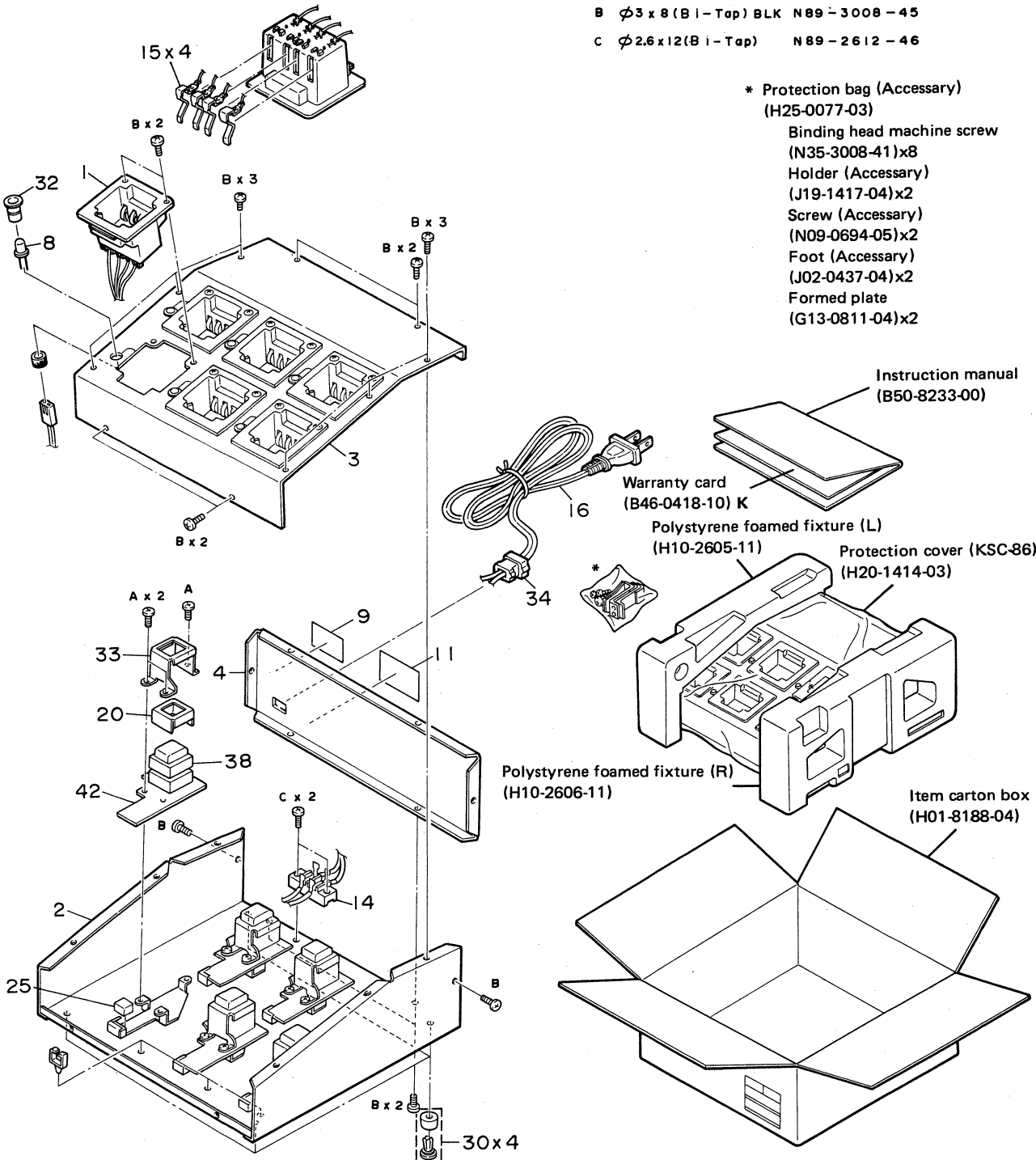
Warranty card
 (B46-0418-10) K

Polystyrene foamed fixture (L)
 (H10-2605-11)

Protection cover (KSC-86)
 (H20-1414-03)

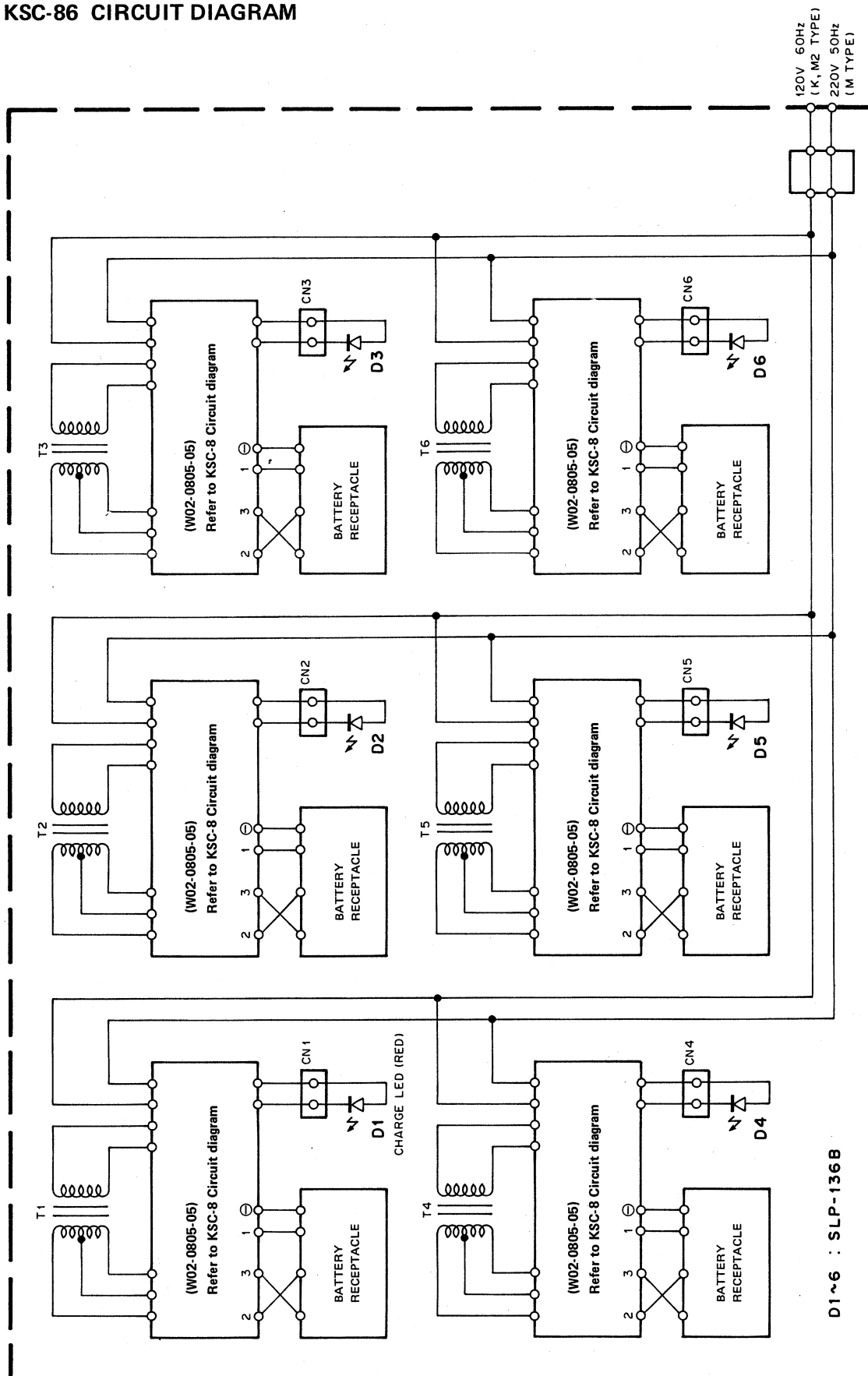
Polystyrene foamed fixture (R)
 (H10-2606-11)

Item carton box
 (H01-8188-04)



KSC-86 (MULTIPLE CHARGER)

KSC-86 CIRCUIT DIAGRAM



SPECIFICATIONS**GENERAL**

Frequency Range	450 — 470MHz
Number of Channels	16
Channel Spacing	25kHz (PLL channel step 12.5kHz)
Battery Voltage	
With KNB-5 or KNB-6	7.5V DC
With KNB-7	12.5V DC
Current Drain	
Standby	60mA
Receive	150mA
Transmit	1.0A at 2W (approx.) with KNB-5 or KNB-6 battery 1.3A at 4W with KNB-7 battery
Temperature Range	—30°C to +60°C (—22°F to +140°F)
Dimensions & Weight	
With KNB-5 (7.5V 600mA battery)	5.41" (137.5mm) H x 2.28" (58mm) W x 1.16" (29.5mm) D, 14.1ozs. (400g)
With KNB-6 (7.5V 1100mA battery)	7.11" (180.5mm) H x 2.28" (58mm) W x 1.16" (29.5mm) D, 18.3ozs. (520g)
With KNB-7 (12.5V 600mA battery)	7.11" (180.5mm) H x 2.28" (58mm) W x 1.16" (29.5mm) D, 18.3ozs. (520g)

RECEIVER (Measurements made per EIA Standard EIA-316-B)

Sensitivity	
EIA 12dB SINAD	0.25 μ V
20dB Quieting	0.35 μ V
Squelch Sensitivity	0.16 μ V threshold
Modulation Acceptance	\pm 7kHz
Adjacent Channel Selectivity	—60dB
Intermodulation	—55dB
Spurious Rejection	—60dB
Image Rejection	—50dB
Audio Power Output	200mW at less than 5% distortion
Frequency Stability	\pm 0.0005% from —30°C to +60°C
Channel Frequency Spread	20MHz

TRANSMITTER (Measurements made per EIA Standard EIA-316-B)

RF Power Output	
With KNB-5 or KNB-6	2W typical at 460MHz
With KNB-7	4W
Spurious & Harmonics	—55dB
Modulation	F3E, \pm 5kHz for 100% at 1000Hz
FM Noise	—43dB
Microphone Impedance	High impedance
Audio Distortion	Less than 3% at 1000Hz
Frequency Stability	\pm 0.0005% from —30°C to +60°C
Channel Frequency Spread	20MHz

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KENWOOD ELECTRONICS BENELUX N.V.

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KENWOOD ELECTRONICS CANADA INC.

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